RUN

THE COMMODORE 64/128 USER'S GUIDE

May 1988
An IDGC/I Publication
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CANADA $3.95
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All About Assemblers

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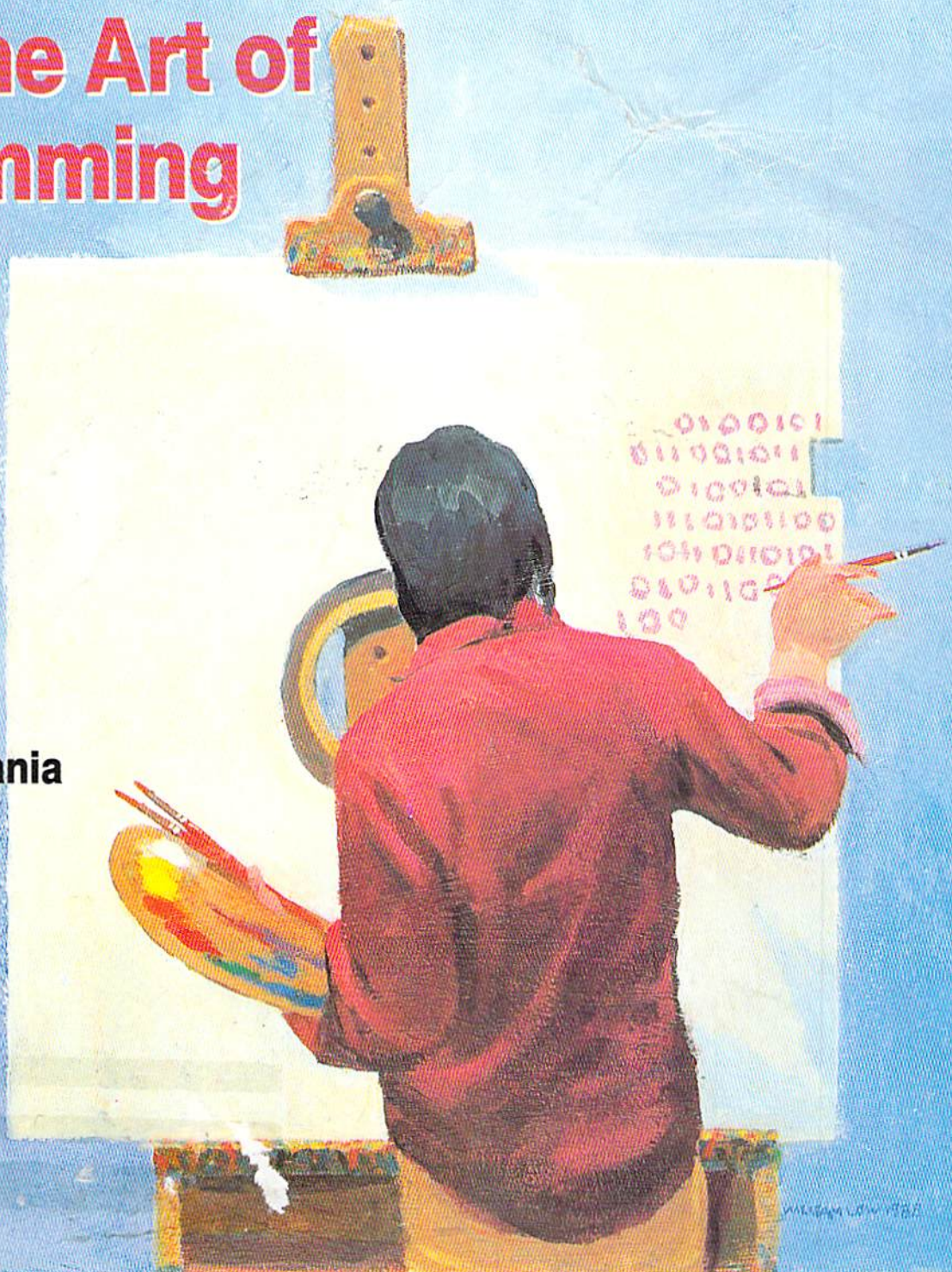

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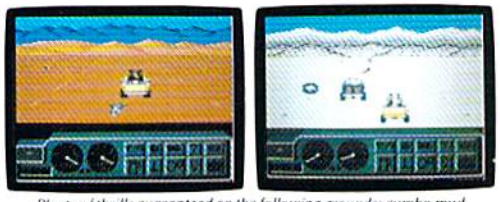
Get ready for four of the most challenging, rugged, rump-bumping cross country road racing courses this earth has to offer.

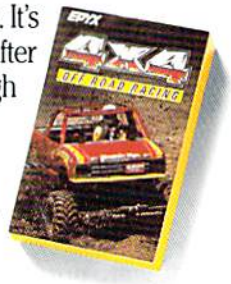


Plenty of thrills guaranteed on the following grounds: gumbo mud, packed snow, skid-sand, and the scrubbiest terrain south of the border.

Fight the torturous terrain of Baja. Rocks, boulders, skid-sand, even a few spikey cactuses. And of course, heat that's hot enough to fillet any forehead. Ever had your hands stuck to the wheel? Permanently. You will when you endure the longest winter of your life in the ice, sleet and slosh of The Michigan Course. The Georgia Red Clay Course has enough mud to keep you a human fossil for 2,000 years. And then there's Death Valley. Get it. D-E-A-T-H Valley.

Start with pre-race strategy. Select and customize your personal vehicle. Your supplies. Your repair equipment. Believe us. You'll need everything. There are boulders, rivers, potholes, and mudbogs to contend with. What are mudbogs? You'll find out. (Just after you find out there's a Demon 4 x 4 chasing you all through the race. A Demon hellbent on your destruction.)

If you win enough races, collect enough points, only then will the Victor's Cup be yours. It's the least we can do. After all, you did go through hell to get there.



4x4 OFF-ROAD RACING BY EPYX

Commodore 64/128, IBM & compatibles, Amiga

Circle 153 on Reader Service card.

SOFTWARE GALLERY 26
Reviews of:

- Deja Vu
- Instant Music
- Apollo 18
- Darkhorn
- Halls of Montezuma
- Cholo
- Dark Lord
- Strategist

* **EASY APPLICATIONS** *by Jesse Sherwood* 68
Short but useful applications for your Commodore computer. Time marches on, and you can watch it on your C-128 clock.

GEOWATCH *by Tim Walsh* 70
RUN's column for users of the GEOS operating system. Berkeley introduces geoSpell, and our readers share some geoTips.

TELECOMPUTING WORKSHOP *by David Bradley* 78
Answers to your questions and other advice on using modems, terminal programs, bulletin boards and online networks.

COMMODORE CLINIC *by Lou Wallace* 80
Got a problem or question related to Commodore computing? This monthly column provides the answers.

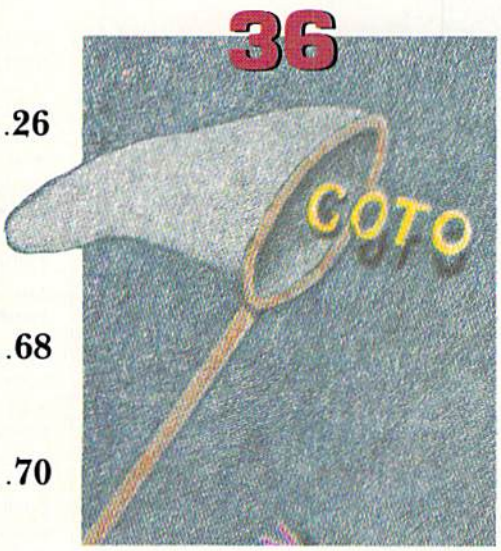
* **MEGA-MAGIC** *by David Archibald* 90
Tips and techniques that are bigger than Magic. Now use Save-with-Replace without endangering your data.

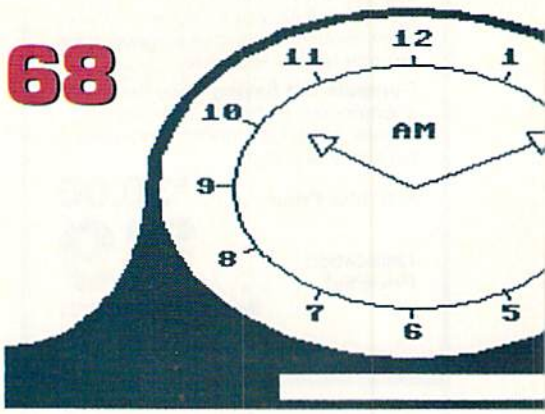
***RUN*'S CHECKSUM PROGRAM** *by Bob Kodadek* 95

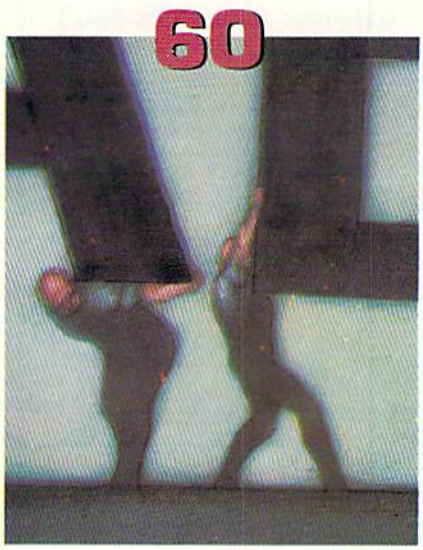
COMING ATTRACTIONS 96

LIST OF ADVERTISERS 96

* THIS ARTICLE CONTAINS A PROGRAM LISTING. THE PROGRAM IS ALSO AVAILABLE ON THE MAY-JUNE 1988 RERUN DISK. TO ORDER, USE THE CARD BETWEEN PAGES 48 AND 49.







RUN (ISSN 0741-4285) is an independent journal not connected with Commodore Business Machines, Inc. *RUN* is published monthly by IDG Communications/Peterborough, Inc., 80 Elm St., Peterborough, NH 03458. Phone 603-924-9471. Second-class postage is paid at Peterborough, NH, and at additional mailing offices. Canadian second-class mail registration number is 9565. Subscription rates in U.S. are $19.97 for one year, $29.97 for two years and $41.97 for three years. In Canada, a one-year subscription is $39.97 in Canadian funds. In Mexico, the one-year subscription rate is $24.97, with U.S. funds drawn on a U.S. bank. Foreign subscriptions are $39.97 for one year, with U.S. funds drawn on a U.S. bank. Please inquire about foreign air mail subscription rates. *RUN* is nationally distributed by International Circulation Distributors. **Postmaster**: Send address changes to *RUN*, Subscription Services, PO Box 954, Farmingdale, NY 11737. (Send Canadian changes of address to *RUN*, PO Box 1051, Fort Erie, Ontario, Canada L2A 5N8.)

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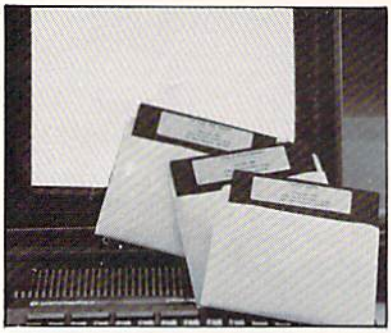

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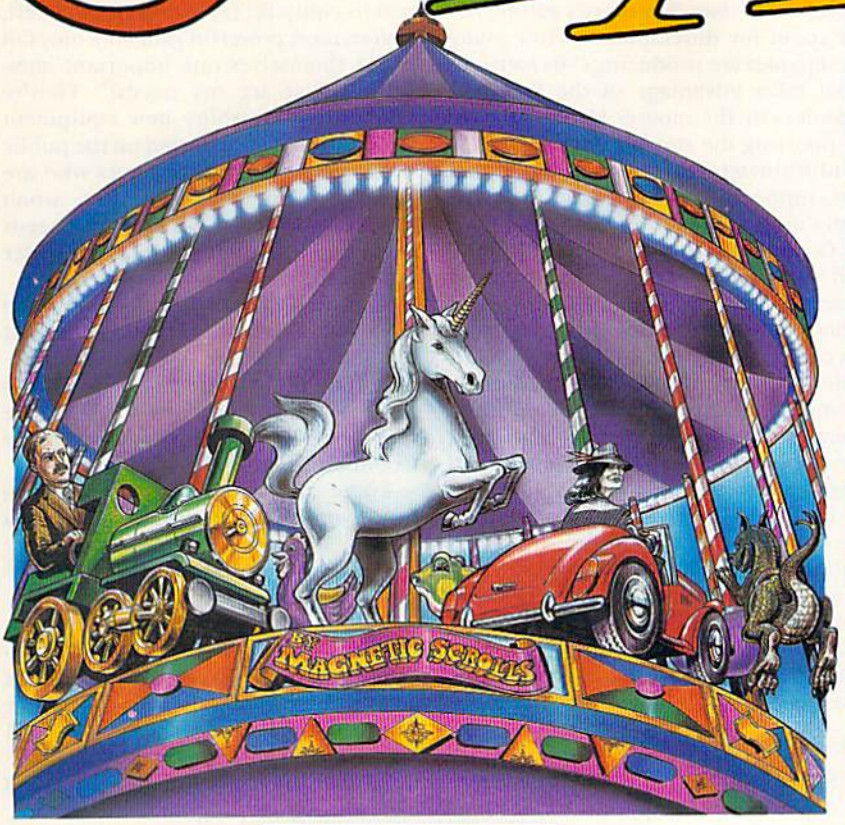
Jinxter



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RUNning Ruminations

Who says the Commodore eight-bit technology is outdated? It still meets the needs of millions of owners.

Over the Hill?

T. S. Eliot has told us what a cruel month April is, but he failed to tell us what a cruel and unforgiving business computing can be.

Just ask owners of the discontinued PC models that litter the high-technology landscape. Some units end up in the graveyard almost unused (PCjr), while others (VIC-20) come to their final resting place after short, but distinguished service in the computer wars.

With more frequency than a Soviet medal ceremony at the Olympics, rumors surface about the demise of the C-64 and C-128. Commodore's eight-bit computers are considered by many to be "over the hill," but they've escaped the throes of oblivion more times in the past two years than James Bond. The official company line from Commodore is that they'll continue to manufacture them as long as people continue to buy them.

Why have so many other computers been abandoned? If a computer fails to meet the needs of the consumer, or if the third-party community fails to provide useful and entertaining software for it, then it won't go far.

The success of the 64/128 line reflects the substantial third-party support it's received to date. But there's still plenty of room for development. How many companies are producing C-64 software that takes advantage of the RAM expanders or the mouse? How many are supporting the capabilities of the 128? Unfortunately, too few. Companies that *are* supporting the 128 indicate that sales are excellent.

Commodore's most successful eight-bit machine, the C-64, was introduced five years ago, which, in the annals of computerdom, is a long time. Advances in computer technology move at a rapid pace, and, in a world where the newest computers feature five-digit chip numbers, megabytes of memory and processing speed that boggles the mind, eight-bit technology is often ridiculed.

But, I really don't need those "high-tech" features. I've resisted the temptation to hop onto the Amiga or IBM-compatible bandwagon. My C-64 at home and my C-128 at work meet my computing needs just fine, thank you. And I'm sure eight-bit computers meet the needs of millions of other users.

On Top of the Hill

So, 16 isn't necessarily better than 8. It depends on the application.

Many people want to participate in the computer revolution, and, in their zeal to equip themselves with the latest, fastest, most powerful gadgetry, they fail to ask themselves one important question: "What are my needs?" They're blinded by the shiny new equipment and glitzy software foisted on the public by overzealous manufacturers who are unsure of their market. But, won't PaperClip on the C-64 meet the needs of the average home computerist better than Word Perfect on the Amiga?

Even in a crowded marketplace, the C-64 and C-128 stand out as the best introductory home computers available. The thousands of new users who are looking for value and a machine that works well needn't look past the Commodore line of eight-bits.

There are many reasons why, even now, you should consider buying a C-64 or C-128:

1. Commodore remains the price-performance leader in the home market.

2. Software made for these computers abounds—home and education applications, personal productivity and tons and tons of games. With its superior sound and graphics capability, the C-64 is the ultimate game machine, and software manufacturers have responded with some great programs.

3. Because it's been in existence for several years now, there's plenty of support for this line of machines. Magazines such as *RUN* are devoted exclusively to the Commodore eight-bits. A network of user's groups stretches across the country, and there's even an electronic online service—QuantumLink—dedicated solely to Commodore owners.

New doesn't necessarily equal better. Most computer owners want ease of use, convenience and power without a hassle. They don't want to be bothered with plugging in boards to utilize their computer's features. I'm all for progress and for advances that make our lives easier, but sometimes an aging technology is the best technology.

Dennis Brisson

Editor-in-Chief

Invitation

If you have a modem, terminal software and a Commodore computer, you can call in to *RUN*'s bulletin board, the RUNning Board, to send messages to, or receive messages from, other users; download and upload an interesting collection of programs and articles; access information; or chat with *RUN* editors who monitor the system and respond to questions online.

Remember, you can access the bulletin board, which uses the popular Punter software, any time, day or night, 24 hours a day for the most up-to-date information about the magazine and supporting products, article information and updates, product information and the Commodore industry.

Another nifty feature of the board is its polling capability, which asks readers to vote and/or reply to certain questions. Results of the survey are periodically posted. Your messages, comments and suggestions are welcome, so give us a call to find out what the RUNning Board is all about.

The number is 603-924-9704. We use the Punter or Xmodem protocols, 300 or 1200 baud (depending on your modem's capability), one stop bit, no parity, full duplex and a word length of eight bits.

C-128 NEWS
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MAGIC

Get the Getkey command for your C-64, stop that annoying cursor blinking or detect Illegal Quantity errors.

Compiled by TIM WALSH

$491 Happy Birthday, Dear Commodore

The next time you throw a birthday party for the kids, play my version of Happy Birthday on your C-64 or C-128 (be sure to try 80-Column Fast mode, too) while the party is going on. Flute and guitar sounds add a lot of sparkle.

```
Ø REM HAPPY BIRTHDAY 64/128 - J.R. CHARNET
  SKI                                    :REM*24Ø
1Ø INPUT "{SHFT CLR}(S)LOW (M)ED (F)AST";T
  $                                      :REM*162
2Ø T=145Ø-(T$="S")*2ØØ+(T$="F")*2ØØ:REM*46
3Ø N$="##)#4Ø##)#<4##UE4Ø)JJE4<4"  :REM*45
4Ø D$="**&&&$**&&&$**&&&&$**&&&#" :REM*196
5Ø S=54272:FORJ=S TO S+23:POKEJ,Ø:NEXT
                                         :REM*44
6Ø POKES+5,13:POKES+12,9:POKES+24,15
                                         :REM*57
7Ø FORJ=1 TO 25:N=ASC(MID$(N$,J,1))+15:GOS
  UB12Ø                                  :REM*56
8Ø D=ASC(MID$(D$,J,1))-34:POKES+1,N:GOSUB
  12Ø                                    :REM*37
9Ø POKES+8,N/2:POKES+4,17:POKES+11,33
                                         :REM*123
1ØØ FORZ=1TOT/D:NEXT:POKES+4,16   :REM*189
11Ø POKES+11,32:NEXT:POKES+24,Ø:GOTO2Ø
                                         :REM*3
12Ø A=A+1:PRINT"HAPPY BIRTHDAY!!":IFA=24TH
  EN A=Ø:PRINTCHR$(147)                  :REM*138
13Ø RETURN                               :REM*17
```

—Joseph Charnetski, Dallas, PA

$492 C-128 Box Rotation

After you've seen some of the C-128 animated graphics created by 80-column Basic extensions such as Ultra Hi-Res (*RUN*, February and May 1986), you'd probably doubt that a few lines of the C-128's built-in Basic 7.0 could animate a rotating rectangle in 40-Column mode. Well, C-128 Rotating Box does. So, gather your friends and neighbors around the computer and let your C-128 spin away!

```
Ø REM 4Ø-COLUMN C-128 ROTATING BOX - PAT M
  ARTIN                                  :REM*123
1Ø X=5                                   :REM*1Ø3
2Ø COLORØ,1:GRAPHIC1,1:COLOR1,4    :REM*218
3Ø BOX 1,1ØØ+X,1ØØ+Y,15Ø,15Ø,X     :REM*25Ø
4Ø X=X+5:SCNCLR:IFX=36Ø THENX=Ø     :REM*17
5Ø GOTO3Ø                                :REM*176
```

—Pat Martin, Keystone Heights, FL

$494 To New or Not To New

Life is hard enough without the added stress from making mistakes on your C-64. To minimize those mistakes, here's ►

TRICK OF THE MONTH

$493 64 Line-Number Highlighter

Nothing is more frustrating than trying to distinguish a program's line numbers from the rest of the line on the C-64's screen. But if you execute 64 Line Number Highlighter before listing your program, it will produce line numbers of a color different from the rest of the listing.

Pressing run-stop/restore won't disable this routine, and its default memory location of 53145 will keep it transparent to most other programming utilities. If you want to change the color, enter POKE 53215,X, where X is a value between 0 and 15.

```
Ø REM LINE NUMBER HIGHLIGHTER - RICHARD PR
  OFT                                    :REM*32
1Ø PRINTCHR$(147)"POKE 53215,X CHANGES LIN
  E # COLORS."                           :REM*179
2Ø FORT = 53145 TO 53241:READ D:X=X+D:POKE
  T,D:NEXT                               :REM*23Ø
3Ø IF X<>12583 THEN PRINT"ERROR IN DATA ST
  ATEMENTS...":END                       :REM*166
4Ø SYS 53145:NEW                         :REM*126
5Ø DATA 169,Ø,133,251,169,16Ø,133,252,16Ø,
  Ø,177,251,145,251,2ØØ,2Ø8,249  :REM*187
6Ø DATA 165,252,2Ø1,191,24Ø,5,23Ø,252,76,1
  61,2Ø7,173,Ø,3,133,251,173,1    :REM*62
7Ø DATA 3,133,252,169,2Ø7,141,1,3,141,236,
  166,169,239,141,Ø,3,169,216     :REM*189
8Ø DATA 141,235,166,165,1,41,254,133,1,96,
  72,173,134,2,133,2,169,1,141    :REM*1Ø9
9Ø DATA 134,2,1Ø4,32,2Ø5,189,72,165,2,141,
  134,2,1Ø4,96,72,169,254,37,1    :REM*153
1ØØ DATA 133,1,1Ø4,1Ø8,251,Ø       :REM*171
```

—Richard Proft, San Antonio, TX

History Repeats Itself!

In 1977 Avalon Hill introduced Wooden Ships & Iron Men to the table top gaming public. Eleven years later, Avalon Hill introduces, for your pleasure, the microcomputer game...

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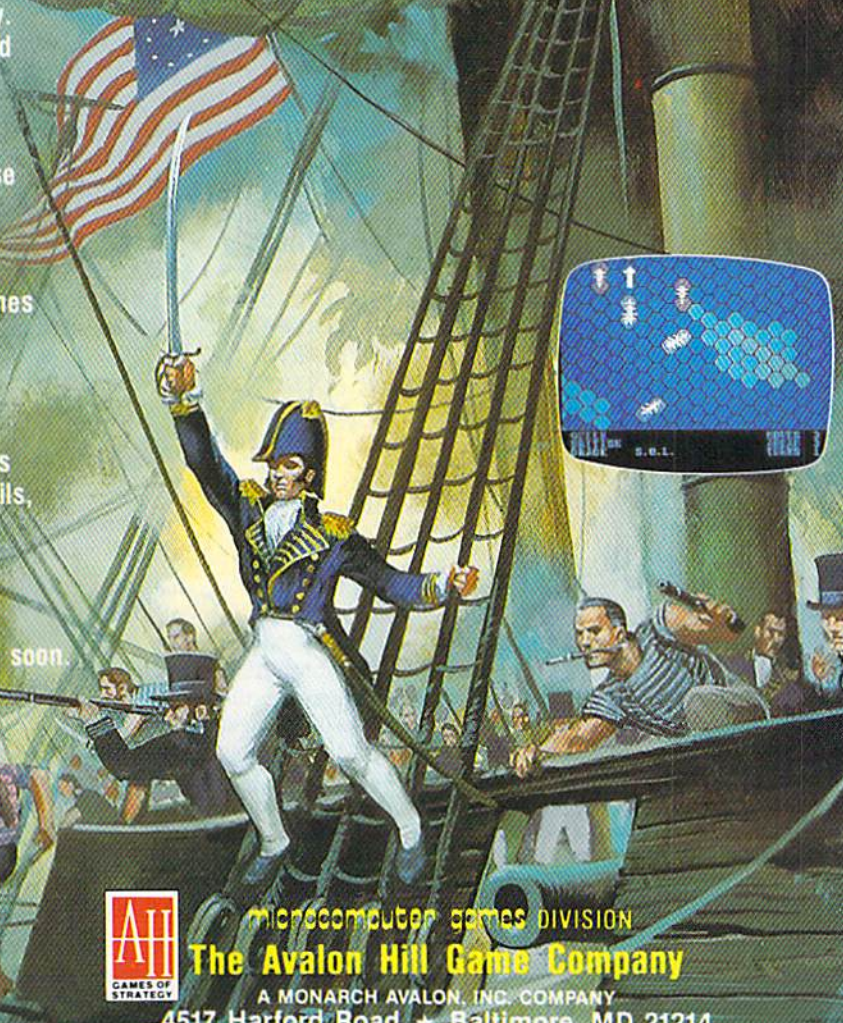

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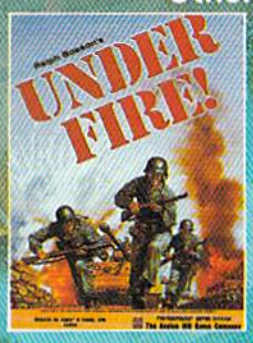

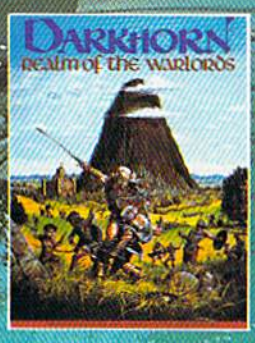

Circle 47 on Reader Service card.

The New Prompt for your C-64. Once you've activated this interrupt-driven program, every New command you issue, whether in Program or Direct mode, causes an Are You Sure? prompt to appear, thus minimizing the likelihood of accidentally erasing valuable Basic programs.

```
Ø REM THE NEW PROMPT 64 - DAILAH HODGE
                                        :REM*82
1Ø FORT=49152 TO 49273:READD:POKET,D:S=S+D
   :NEXT                                :REM*141
2Ø IFS<>15262THENPRINT"ERROR IN DATA...":E
   ND                                   :REM*132
3Ø SYS 49152                            :REM*2Ø4
4Ø DATA 169,Ø,141,21,192,141,24,192,169,16
   Ø,141,22,192,141,25,192,16Ø          :REM*1Ø2
5Ø DATA Ø,162,Ø,185,255,255,153,255,255,2Ø
   Ø,2Ø8,247,174,22,192,224,191         :REM*66
6Ø DATA 24Ø,9,238,22,192,238,25,192,76,2Ø,
   192,165,1,41,254,133,1,169           :REM*226
7Ø DATA 76,141,68,166,169,67,141,69,166,16
   9,192,141,7Ø,166,96,16Ø,Ø            :REM*173
8Ø DATA 185,1Ø2,192,24Ø,9,32,21Ø,255,2ØØ,2
   4Ø,3,76,69,192,32,228,255            :REM*243
9Ø DATA 24Ø,251,32,21Ø,255,2Ø1,89,2Ø8,6,16
   9,Ø,168,76,71,166,96,65              :REM*228
1ØØ DATA 82,69,32,89,79,85,32,83,85,82,69,
    32,4Ø,89,47,78,41,Ø,Ø               :REM*25?
```

—DAILAH HODGE, ST. CROIX, VIRGIN ISLANDS

$495 COOKING (WITH) YOUR C-64

My C-64 used to crash after being left on for a few hours, so I opened up the computer case and took a peek at the internals. I figured it was a problem with the computer's combination heat sink/RF shield overheating, since the crashes occurred only after a considerable amount of heat had built up. I unscrewed the shield, painted it flat black and re-installed it, using heat-sink compound on the tabs that come in contact with ICs. I also bent those tabs to ensure maximum contact and maximum heat dissipation.

To top things off, I fashioned a homemade heat sink from a piece of ½ × 1½-inch aluminum and attached it with a screw and nut to the 7812 voltage regulator. Since I've made these minor hardware enhancements, my C-64 performs flawlessly, regardless of how long I leave it on. Of course, these modifications void the warranty, but the chances are that if your C-64 is still under warranty, its internals aren't likely to overheat any time soon.

—WILLIAM B. SHEA, CHANDLER, AZ

$496 PARTITIONING YOUR 1581 DRIVE

Look on your 1581 Test Demo disk's directory and you'll find a program for partitioning your 3½-inch disks. By partitioning, you can divide your disks into smaller directories, a must when you have 808K of storage space on a disk! Once you get your disks partitioned, though, you may find it tiresome to type OPEN 15,8,15,"/0:PROGRAM NAME":CLOSE 15 every time you access a partition.

To alleviate this problem, I wrote 1581 E-Z Partition, which works in both 64 and 128 modes. Type it in and substitute the names of each of your disk partitions for menu selections 1, 2 and 3. Next, save a copy to the root (main) directory of each of your 1581 disks. Then the next time you want a particular partition from a disk, just run my program and select the desired partition from the menu.

```
Ø REM OPENING 1581 DISK PARTITIONS (64 & 1
  28) - ALAN L. BROWN                   :REM*249
1Ø PRINT"{SHFT CLR}OPEN WHICH 1581 PARTITI
   ON?"                                 :REM*1Ø6
2Ø PRINT"1. ONE"                        :REM*56
3Ø PRINT"2. TWO"                        :REM*23Ø
4Ø PRINT"3. THREE"                      :REM*27
5Ø GETA$:IFA$=""THEN5Ø                  :REM*13
6Ø PRINT"WORKING...":OPEN 15,8,15,"IØ":CLO
   SE 15                                :REM*139
7Ø IF A$="1" THEN OPEN 15,8,15,"/Ø:ONE":GO
   TO 1ØØ                               :REM*29
8Ø IF A$="2" THEN OPEN 15,8,15,"/Ø:TWO":GO
   TO 1ØØ                               :REM*218
9Ø IF A$="3" THEN OPEN 15,8,15,"/Ø:THREE":
   GOTO 1ØØ                             :REM*2Ø8
1ØØ CLOSE15:GOTO 5Ø                     :REM*32
11Ø CLOSE 15:PRINT"ALL DONE!"           :REM*31
```

—ALAN L. BROWN, ISLINGTON, ONTARIO, CANADA

$497 NEW GET COMMAND FOR THE 64

Anyone who has spent time programming on the C-128 knows the simplicity and usefulness of the Getkey command, which lets 128 programmers create lines of Basic code such as:

```
100 GETKEYA$
```

Line 100 halts all program execution until a key is pressed. Because Basic 2.0 on the C-64 lacks a Getkey command, 64 programmers do not have the luxury of such simple statements. In Basic 2.0, the above example translates as:

```
100 GETA$: IF A$ = ""THEN 100
```

My program, New Get Command, modifies the C-64's Get statement to give a command that works just like the C-128's Getkey command. After activating my program, the syntax for the above samples will appear as:

```
100 GETA$
```

Whether you're new to programming or an experienced programmer, you'll find this an invaluable command. Since the new Get command resides in the rarely used memory locations 679 to 687, it can be used with many other machine language utilities without any memory conflicts.

```
Ø REM GETKEY FOR C-64 - RICHARD PENN
                                        :REM*97
1Ø FORT= 679 TO 687: READ D:POKE T,D:NEXT
                                        :REM*2Ø5
2Ø POKE 81Ø,167:POKE 811,2               :REM*5
3Ø DATA 72,165,198,24Ø,252,1Ø4,76,62,241
                                        :REM*149
4Ø REM PLACE YOUR PROGRAM HERE          :REM*232
1ØØ PRINT"GETKEY DEMO - PRESS ANY KEY":GET
    A$:PRINT A$                         :REM*157
```

—RICHARD PENN, MONTREAL, QUEBEC, CANADA

Continued on p. 85.

STEALTH MISSION

Introducing a new generation of strategic gaming excellence from SubLOGIC! Stealth Mission redefines the state of the art in simulation sophistication and playability.

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News and New Products

This month we continue our coverage of the many goodies featured at the Las Vegas CES.

Compiled by HAROLD R. BJORNSEN

Four New Games For the C-64

CUPERTINO, CA—Accolade (20813 Stevens Creek Blvd., Cupertino, CA 95014) has released four new games for the C-64.

Power At Sea, a naval combat simulation, is based on the World War II Battle of Leyte Gulf. As the captain of a fleet consisting of a battleship, cargo/troop ship and an aircraft carrier with fighter bombers, your mission is to infiltrate and secure Leyte Gulf, which is under enemy control. $29.95.

In **The Train: Escape to Normandy**, you take the role of a French Resistance leader in charge of seizing the armored "war train," which contains France's greatest art treasures, including Renoirs, Monets and Picassos, and guiding it through enemy lines to safety at Riviere, Normandy. $29.95.

Card Sharks, a card-playing simulation featuring poker, blackjack and Hearts, has you facing interactive computer-controlled opponents who ask questions and speak their mind when their game turns sour. $29.95.

Plasmatron, an arcade-style sci-fi adventure from Accolade's Avantage line, has you piloting your space craft to a hostile empire, where you must locate and neutralize all aliens. $14.95.

Check Reader Service number 404.

Good Enough for The Queen

SAN FRANCISCO—Chronicle Books (One Hallidie Plaza, San Francisco, CA 94102) has published *Design for Desktop Publishing: A Guide to Layout and Typography on the Personal Computer*. The 112-page, large-format paperback, which is spiral-bound to lie flat for easy access, guides readers along, giving advice for every step of the desktop publishing process. It discusses such topics as type distinctions, layout, tabular material, illustration, color, binding and the characteristics of paper. A graphic designer for 30 years, author John Miles is also Typographical Advisor to the Stationery Office of Her Majesty the Queen of England. $14.95.

Check Reader Service number 405.

A Clear and Perfect View

SIMI VALLEY, CA—PerfectData (1825 Surveyor Ave., Simi Valley, CA 93063), a manufacturer of computer-care goods, has released two products for your monitor screen.

The Perfect-Vu Screen Filter, made of optically correct, shatterproof acrylic materials, reduces CRT surface glare and increases image contrast. The screen comes in eight sizes ($9^1/_8$ by $7^3/_8$ inches to 13 by $10^{13}/_{16}$ inches) to fit any terminal and attaches via Velcro fasteners. $29.95.

StatFree Wipes are disposable, non-residual pads that clean CRT screens without leaving streaks and dissipate static electricity buildup. The pads are packaged in a dispenser that attaches to the side of your monitor for convenient cleanup. $4.70.

Check Reader Service number 406.

Landmark

BALLWIN, MO—PAVY Software (PO Box 1584, Ballwin, MO 63022) has released Landmark, The Computer Reference Bible, in a new version for the C-64. The package includes a menu-driven, machine language program disk, 24 double-sided disks containing the entire King James version of the Bible, with complete references and the words of Christ highlighted in color, a user's manual and a Concordance, on six double-sided disks, of over 3300 of the most frequently looked-for words. Other features let you print files, outline text in a color of your choice, record permanent notes of your Bible study, add to and create new references and search any chapter. A C-128, 80-column version is slated for release in November. Landmark is available for $164.95.

Check Reader Service number 407.

Four New Games

CHATSWORTH, CA—Three new games from Intellicreations (19808 Nordhoff Place, Chatsworth, CA 91311) start off their new year.

First up is the submarine-combat simulation, **The Hunt for Red October**, based on Tom Clancy's best-selling novel. You play the role of Soviet submarine Captain First Rank, Marko Ramius, who wants to defect to the U.S. and ►

Seize a train holding France's greatest art treasures in Accolade's The Train: Escape to Normandy.

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In **BattleDroidz**, an action-strategy game for the C-64, you control one of three different droidz in deadly combat with the resident aliens of a far-away planet. The game has 3-D scrolling action, 37 different landscapes to explore, a view-map option, a high-score save option and three different BattleDroidz to control. $24.95.

In the year 2746, the eight planets of the Hyturian Star System formed **The Rubicon Alliance** to prevent further interplanetary war. Now the peace has been shattered by the invasion of the planet Nono, carrying with it a hostile and aggressive race. As Hawkins, pilot of the legendary Starfox space fighter, and with your C-64, your mission has eight stages, each with a specific goal and time limit that will eventually lead to the location of Nono for a final confrontation. The Rubicon Alliance retails for $19.95.

As the **Global Commander**, you've been given the least-coveted job in history: to coordinate the Satellite Network orbiting Earth and act as the chief negotiator for the planet. You must keep an eye on each of the 16 United Nuclear Nations and prevent destruction of the planet while making sure each nation has a sufficient supply of raw materials, food and weapons for its own protection. Global Commander is available for the C-64 for $29.95.

Check Reader Service number 400.

Seven More C-64 Games Plus a VCR Program

REDWOOD CITY, CA—**The Games—Winter Edition** is set in the Rocky Mountains above Calgary, Alberta, Canada. As an athlete you will compete in the events of Oval-Track Speed Skating, Downhill Skiing, Slalom, Luge, Ski Jump, Figure Skating and Cross-Country Skiing. For up to eight players, the package is available for $39.95.

Death Sword, a number-one best-seller in Europe under the name Barbarian, transports players back to the dark ages where barbaric guards are holding the lovely Princess Mariana captive. The evil sorcerer, Drax, will release her only if you can beat the guards in a sword battle. The game retails for $24.95.

In **Street Sports Soccer**, players begin by choosing their playing field (park or city street), picking a three-player team from a cast of neighborhood characters (each with his or her own unique skills and personality), playing against the clock or a pre-set score. The winner is the team that's best at controlling passes, heading the ball, executing intricate shots and scoring goals. It carries a suggested retail price of $39.95.

In **4 x 4 Off-Road Racing**, you choose your own rig and load it with equipment you'll need to win the race. You'll take into consideration the terrain, temperature and weight before clawing over hills, bogging through mud holes and contending with road obstacles, heat and freezing cold. You'll also have to watch out for the renegade demon truck bent on your destruction. $39.95.

Impossible Mission II marks the return of the malicious mastermind, Elvin. In this sequel to Impossible Mission, Elvin has planned for world domination, and you, as a 25th century sleuth, must outsmart him in his futuristic fortress in a hi-tech office complex filled with destructive devices. $39.95.

The **Sporting News Baseball**, a baseball simulation, lets you hit, run, bunt and pull the ball. You can attempt steals, pick-offs and brush back pitches. All the action is influenced by the actual capabilities of the ballplayers and their stats, and you can compete against a friend or the computer. $39.95.

In **L.A. Crackdown**, you assume the role of a senior detective who must direct the actions of a promising young rookie who is hot on the heels of a major drug ring. Your mission is to gather enough evidence to make a bust. The rookie gains in experience as he works with you and develops a real mind of his own. $39.95.

Home Video Producer—which is not a game—is a program that adds text, graphics and special effects to your home videos shot with a camcorder. Use pre-designed segments or choose from over 75 different color graphics, ten different typefaces, eight borders and many colors to create your own productions. It's available for $49.95. All from Epyx, PO Box 8020, Redwood City, CA 94063.

Check Reader Service number 401.

Another New C-64 Game

MOUNTAIN VIEW, CA—**Star Rank Boxing II**, a boxing simulation available for $29.95, adds new elements to the original Star Rank Boxing package, such as fluid animation and better player control over the boxers. You can take on a friend in any of three weight classes or take a shot at the title, competing against computer opponents through the Star Ranks. It's available from Activision, PO Box 7286, Mountain View, CA 94039.

Check Reader Service number 402.

Seven Um, More New Er, Games for the Ah, C-64

GRANADA HILLS, CA—MicroIllusions is releasing, through its distributor, Activision (address above), seven new games for the C-64.

First up is **Land of Legends**, a fantasy role-playing game, featuring dungeons, magic spells, monsters and three kinds of magic: clerical, sorcery and enchantment. An overhead screen view enables you to watch your adventurers take on enemies blow by blow, rather than experience the action through descriptive text. There was no price set at press time, but it should be around $40.

Next is **Ebonstar**, a seek-and-destroy, in-space adventure for up to four players. It's 3000 AD, and mankind has conquered space and eliminated disease, war and poverty. The only thing left to do is indulge in the favorite sport of 31st century man: an in-space competition to seek and destroy roving black holes. The $39.95 game contains over 50 levels of difficulty and complexity.

In **Galactic Invasion**, an intergalactic dogfight that pits galaxy against galaxy, players must invade the enemy's galaxy to capture and destroy their satellite stations, then collect the materials necessary to build the ultimate doomsday weapon for the enemy's total annihilation. $24.95.

The Faery Tale Adventure fantasy role-playing game incorporates 17,000 surface screens and 2000 undergound screens. Players travel as three brothers pursuing a quest through the land of dragons, wizards and princesses. $49.95.

Fire Power is an arcade-style tank-battle game in which you compete with other players to capture opponents' flags and attempt to become king of the hill. $24.95.

Black Jack Academy, which is not a game, strictly speaking, but a game *tutorial*, teaches novices and lets professionals fine-tune playing strategies for the card game. It accommodates up to five players, and the program's varying table rules can be preset. It's $39.95, if you're willing to gamble.

In **Romantic Encounters at "The Dome,"** players live out fantasies in a futuristic hi-tech singles club with parties, dancing and romantic encounters. Romancing "The Dome" will incur a cover charge of $39.95.

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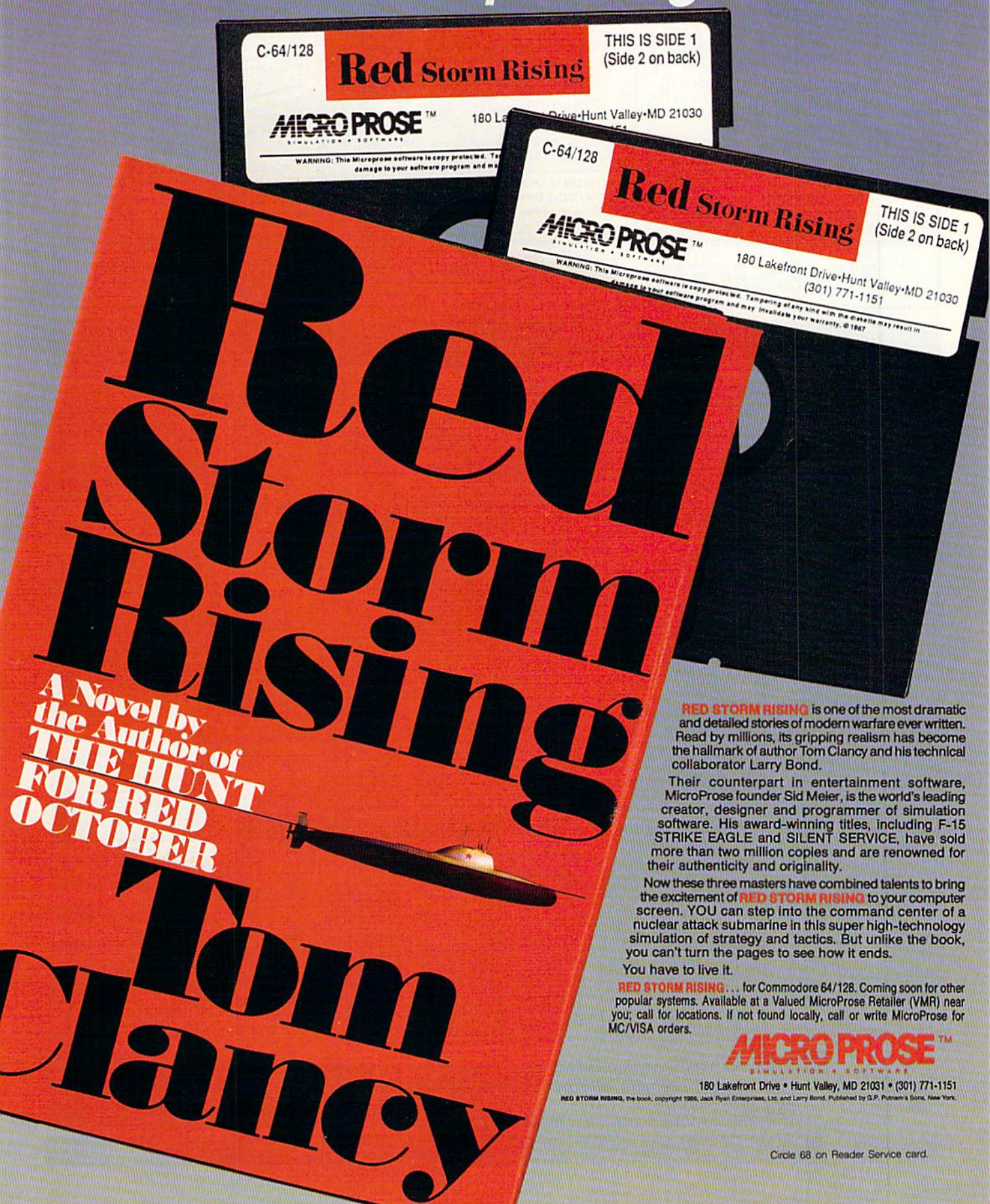

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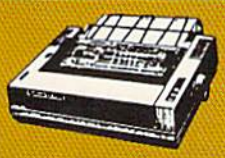

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MAIL RUN

This month's letters include tips on CP/M, printing with the popular Canadian word processors and a tractor feed for the Okidata 180.

DISCONTINUED COMMODORES?

A couple of mail order companies have told me that Commodore has recalled the C-128D and discontinued its PC clones. Is this true?

—BAKER JAMESON
LIVERPOOL, NY

No. The 128D is still in production; it's just not always immediately available to vendors. According to sources at Commodore, the number of 128Ds the company manufactures is based on the number that vendors order. If a vendor runs out and wants more, he may have to wait until the machines are produced.

As for the clones, yes, the PC10-1 and PC10-2 are no longer being made, but they've been replaced by the PC10-3, a faster, "turbo" model.

—EDITORS

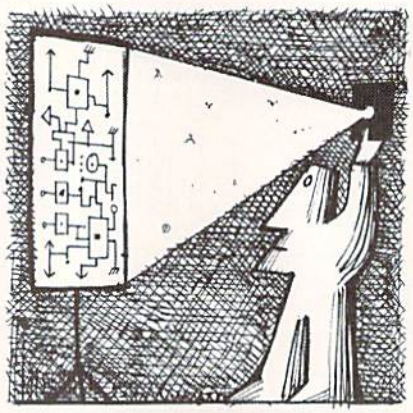
RUNNING RUN COPY

I was glad to find RUN Copy in last February's magazine, because I'd been looking for a good program for backing up my disks. However, I had trouble getting it to run. After removing all my typing errors and rereading the article three times, I finally inspected the Basic part of the program and found a clue. The program listed in the article is called RUN Copy, and it wants to write a machine language program, also called RUN Copy, to disk. I was having trouble, because it's impossible to write more than two files with the same name to a disk. All I had to do was place a second disk in the drive when I ran the program listed in the article, then load and run RUN Copy from that disk. The second disk can be unformatted, because RUN Copy will format it automatically.

—FRED NICHOLS
LEBANON JUNCTION, KY

GEOS CLIP ART

I've just received my March issue of *RUN*, and I'm dismayed to see that our



company name was omitted from the list of sources for GEOS clip art in the "geoNewsletter" article. We've been marketing our DiskArt disks, containing the original ready-to-use GEOS graphics, for almost a year. Our graphics are featured on the GEOS 128 package and as demos in the geoPublish program.

—WILLIAM ZEILINGER
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PRINTING WITH CANADIAN WORD PROCESSORS

In last February's Mail RUN, Richard Geyser asked if any readers knew of a printer driver that would work properly with ProLine's WordPro 64/S word processor and his new Citizen Premier 35 printer. He said the printer, which replaced his Commodore 1101, is touted as Diablo 630-compatible, but his Diablo 630 proportional spacing driver produced nothing but garbage. In this connection, I want to mention something you might often overlook, especially with word processors from Canada.

I have a Commodore DPS 1101, which I got to work fine with Batteries Included's PaperClip after I created a printer driver with BI's auxiliary setup. Afterwards, I found out that I could have used the printer file for the 8400 *if* I'd changed DIPswitch 3 from Commodore ASCII to true ASCII. This bit of information appeared in a newsletter from Batteries Included.

Still later, I purchased Pocket Writer, from Digital Solutions, but the printer driver for my DPS 1101 wouldn't work. I tried printing out the ReadMe file on the disk, but all I got was garbage. Then I recalled the suggestion from Batteries Included and changed my DIPswitch from Commodore ASCII to true ASCII. Lo and behold, it printed perfectly!

I don't know what switches the Citizen 35 has, but I'd suggest you change the ASCII setting and try the printer file again. Even though these Canadian word processors are designed for Commodores, their documentation does not tell which version of ASCII they're expecting.

—NANCY M. KLEIER
PASADENA, CA

THE SAVE-WITH-REPLACE BUG IDENTIFIED

I'm writing to comment on Eric R. Pickell's letter in March's Mail RUN about trapping the Save-with-Replace bug. He mentioned that he had been bitten by the bug after issuing the command DSAVE"@REPORT". Actually, he wasn't bitten by the bug. He used the Save-with-Replace command for the C-128 instead of the C-64 and ended up with a filename preceded by @ in his disk directory.

For those who don't understand the Save-with-Replace bug, here's an explanation. When you use Save-with-Replace, it occasionally happens that the disk sectors that store the file aren't properly allocated. Then, when you save an additional file to the disk, it goes where the "bad" file was previously stored. For instance, if the original file was named REPORT and you saved the second file as STORY, the contents of STORY would be returned when you loaded REPORT. *That's* the infamous Save-with-Replace bug.

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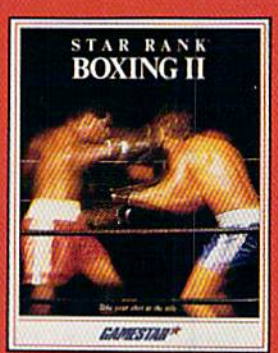

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prevention is to replace the ROMs in your disk drive. It's much safer never to use Save-with-Replace at all.

—NOLAN WHITAKER
JEFFERSONVILLE, KY

CP/M USERS SPEAK UP

I finally have to respond to Robert Lauder's letter in last October's Mail RUN, in which he asked for information about CP/M word processors and databases. I use MicroPro's WordStar 4, the most recent version of that industry-standard word processor. WordStar 4 offers many new features, such as macros and an unerase command, and the package contains terminal and printer installation software and instructions, full documentation, MailMerge and a program called Word Plus, which provides a spelling checker and other writer's utilities.

MicroPro states that two disk drives are required, and at least one must be a 1571, because WordStar comes in Osborne or Kaypro format. CP/M is so disk intensive that I've also found a RAM expansion cartridge (as a RAM disk) and a 1581 drive are of great help.

You can purchase WordStar 4 directly from MicroPro, PO Box 7079, San Rafael, CA 94901; phone 800-227-5609. The price is $89, plus $5 shipping and handling.

For a CP/M database, I use dBase II, version 2.43 (the latest CP/M version). I was lucky one day and found version 2.41 at a Kaypro dealer for an extremely low price. Now, Ashton-Tate has provided me with a free update. I've seen ads from an outfit called Worswick Industries (4898 Ronson Court, Suite H, San Diego, CA 92111), which sells dBase tutorials for $125.

I haven't used a spreadsheet, but SuperCalc seems to be the most popular for CP/M. The Public Domain Copying Company (33 Gold St., New York, NY 10038) has had some spreadsheets for the Osborne in the past, and they offer many other CP/M programs that will run on a C-128.

I would also highly recommend joining FOG (First Osborne Group), a nationwide CP/M user's group and source of public domain software. They send a starter disk with utilities, an editor and a 300-/1200-baud terminal program for any Hayes-compatible modem. They also publish a monthly magazine with sections on the C-128, dBase and SuperCalc.

Finally, I found a book at my local library called *A Guide to CP/M*, second edition, written by Thom Hogan and published by Osborne Books. It has special sections on CP/M Plus that were very helpful.

—STEPHEN R. EMERS
BELLMORE, NY

Thanks, Stephen, for your compendium of information on CP/M. C-128 users who are interested will find other sources of public domain CP/M software listed on page 85 of last month's RUN. *C-128 users who haven't tried CP/M, read on...*

—EDITORS

I'm a C-128 owner who got frustrated trying to use over-protected Commodore programs from unconcerned dealers and publishers. In desperation, I decided to try CP/M and got in touch with Ralph Lees, Jr., of Poseidon Electronics (103 Waverly Place, New York, NY 10011; 212-777-9515). He was very helpful, and in a short time I was manipulating my inventory, outlining my thoughts, and more, in a way I never could before. The sort of attention Ralph pays to his customer's needs is indeed rare.

The success I've had with CP/M has encouraged me to buy more Commodore equipment, including a second 1571 disk drive and the 1750 RAM expander, which serves as a fast drive with CP/M. The ease with which CP/M handles multiple drives, plus its whole glitzless environment, make it a joy to work with.

CP/M is often cited as obsolete, but I feel obsolescence should be a matter of judgment for the individual user, based on his or her requirements. I'd encourage C-128 users who are having trouble using their machines for serious productivity to get acquainted with CP/M. Remember, too, that classic and powerful commercial CP/M programs, such as dBase II and WordStar, are viable alternatives to commercial Commodore software and even to buying an MS-DOS system.

—RONALD B. KUGEL
PLEASANTVILLE, NJ

I recently purchased a CP/M genealogy program called My Family Record, distributed by Everton Publishers, and I think other C-128 owners who are interested in their family roots should know about it. Family Record is easy to use and handles any kind of data you might want to keep. A utilities disk you buy separately prints out many types of charts on forms also available from Everton. The program comes on Kaypro single- or double-sided disks and requires two disk drives, preferably 1571s, because they are much faster than 1541s with CP/M. You also need MBasic, which is included on the utilities disk, in case you don't have it already.

The price for My Family Record is $99.50, and the utilities disk costs $49.50. Some may call these figures steep, but the program is worth it. For more information, contact Everton Publishers, PO Box 368, Logan, UT 84321; 800-453-2707 or 801-752-6022.

—WAYNE A. DOWELL
ABINGDON, IL

TRACTOR FEED FOR THE OKIDATA 180

I own an Okidata 120 printer and read with interest Tim Walsh's review of the Okidata 180 last January. I've had a chance to check out a 180, and I agree with almost all of Tim's findings. In fact, his review has convinced me to purchase one as my next system upgrade.

In the course of checking out the 180, I discovered that the optional tractor-feed kit Okidata offers for its Microline series fits this new printer very nicely. I purchased one for my 120 for about $40, including shipping, and it works great. It consists of the tractor, a printer-well cover (to replace the longer one furnished with the printer) and a dust cover. Contact Okidata at 532 Fellowship Rd., Mt. Laurel, NJ 08054; 609-235-2600.

—ROBERT A. PERRY
APO, SAN FRANCISCO

GUNSHIP DECORATIONS

I just read the piece in January's News and New Products about Larry Woodworth, the winner of the Congressional Medal of Honor in the Gunship game. He's not the only one to hold this award, and surely he and I aren't the only two. I had no idea MicroProse was looking for Congressional Medal of Honor winners. From one pilot to another, I congratulate Larry.

—SCOTT CUNNINGHAM
LAS CRUCES, NM

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SOFTWARE GALLERY

This month, if you're not up in space, we'll have you on the battlefield or the concert stage!

Compiled by BETH S. JALA

DEJA VU ..... B

Who Are You?

Where Are You?

Don't bother to pinch yourself—this isn't a dream. You really are sitting in the beat-up restroom stall of this sleezy dive. That really is your coat and shoulder holster hanging on the door, and, you vaguely recall, there really is a stiff upstairs, just waiting to be discovered. One thing is certain, though: sitting around this place is just begging for trouble. Yes sirreee! Just as sure as your name is.....?!

For most of us, deja vu is a feeling of having returned to a place one has never been before. But, if you're a hard-nosed private eye who has somehow developed amnesia, then anything that jogs your muddled memory becomes a matter of life and death.

In Mindscape's Deja Vu, it's pretty clear that "somebody down here doesn't like you," and that, in Maltese Falcon parlance, you have been set up for "the big fall." Your problem is surviving long enough to unscramble that razor-sharp mind and, just maybe, turn the tables. As to the who, why and how. . .well kid, good luck!

Unlike most graphics/text adventures, almost everything in Deja Vu is handled via joystick. With the advanced point-and-click interfacing, you can quickly direct movement, obtain descriptions of items, speak to other characters, conduct searches and operate with an item—like a key or gun—upon another item—like a door or a thug.

Your view uses only about half the screen. The rest is devoted to text descriptions, the command palette and a permanent, scrollable inventory window that shows the items in your possession. Opening containers like drawers, coats or wallets, produces temporary windows that show other contents. (For instance, you can even count the bullets in your gun!)

The game supplies plenty of juicy leads, including a special Deja Vu screen to highlight significant, memory-jogging clues. But, there's also a fair amount of real estate to cover. The opportunities for fatal errors multiply when you factor in moderate time pressure—you're in danger of keeling over from exhaustion. Unless you're planning on a long stay in the "big house," good maps and notes are essential.

While Deja Vu offers only mediocre artwork and zilch for sound, you'll find decent speed, smooth stick controls, and an excellent manual written in Sam Spade-ese that sets the right mood. Most importantly, you get an intriguing scenario. This game is a solid, enjoyable challenge to your puzzle-busting savvy. *(Mindscape, Inc., 3444 Dundee Rd., Northbrook, IL 60062. C-64/$34.95.)*

—JEFF HURLBURT
HOUSTON, TX

INSTANT MUSIC ..... B+

Get Ready to

Go On Tour

With Your Band!

Instant Music could be called music software with a split personality. As performance software, the package lives up to its name by letting you boot the program, grab a joystick or mouse, and instantly play along with the catchy theme music. As a tool for composition, you can use it to quickly draw new patterns of notes across the screen even while the music is playing.

In either mode, you can choose to be strictly guided, both rhythmically and in terms of note selection, so that it's impossible to be off-beat or out of tune. Then, as your skills improve, you can compose and perform with fewer rhythmic and tonal restrictions or go at it totally unguided to be as creative (or as off-key!) as you like.

Only three instrument sounds can be used simultaneously in a composition, but a musical palette of 12 is available. These range from imitations of conventional instrument sounds like piano, flute and strings, to synthesizer and special effects. Each sound can be modified by using Instant Music's somewhat limited synthesizer controls, or new sounds can be created and saved to disk along with your composition.

The Instant Music screen uses vertical lines to divide your composition into as many as 32 measures. Instead of conventional musical notation, however, the notes for each of your three ►

REPORT CARD

A Superb!
An exceptional program that outshines all others.

B Good.
One of the better programs available in its category. A worthy addition to your software library.

C Average.
Lives up to its billing. No major hassles, headaches or disappointments here.

D Poor.
This program has some problems. There are better on the market.

E Failure.
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instruments are shown as colored horizontal lines of various lengths. The longer the line, the longer the note sounds; the higher it appears on screen, the higher the note's pitch.

Although Instant Music is designed to play three-part compositions using the C-64/128's SID chip, the program can also be used to control MIDI-equipped musical instruments, provided you have the required interface.

Instant Music comes with an excellent variety of over 60 compositions on the program disk. Included are classical, folk, blues and reggae tunes, as well as several rock and jazz chord progressions.

Instant Music's manual contains a short guided tour of the program, followed by eight etudes that take you from basic music editing to advanced polyrhythmic composition. Finally, a quick-reference section, complete with keyboard equivalents for pull-down menu commands and a glossary of musical terms, helps you get the most out of the program. *(Electronic Arts, 1820 Gateway Drive, San Mateo, CA 94404. C-64/$29.95.)*

—Bob Guerra
South Boston, MA

Apollo 18 ..... A

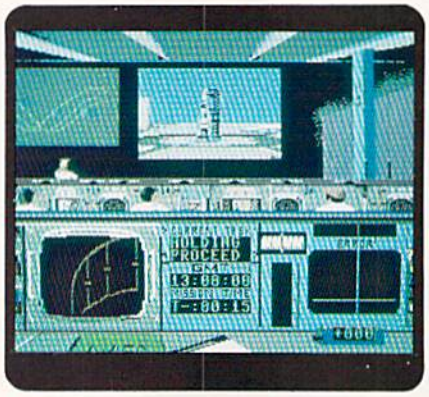
One Small Step
For Man; One Big Step
For Your Commodore

With the recent U.S. commitment to build a space station, there couldn't be a better time for "last frontier" enthusiasts to limber up those astronautical skills. On this occasion, the NASA project contractor is Accolade and your assignment is Apollo 18. This game takes you "where no game has gone before": a complete moon mission simulation from blast off through splash down.

In Apollo 18, you take on the roles of pilot and mission specialist. You must respond to Mission Control directives, execute critical maneuvers and perform EVA tasks on the moon and in space. As in the "real thing," Houston maintains both telemetry (screen read-outs) and radio (digitized voice) communication. You encounter authentic control panels, and, of course, there's a solid emphasis on timing and accuracy.

For the purpose of scoring and in order to provide essential GO/NO GO decision points, a full mission is divided into several sub-missions. The first, Blast Off, begins at the T – 15 hold, where, after setting switches and receiving a GO, the countdown restarts and "we have ignition!"

Among the more challenging mission stages, Blast Off puts your eye or button-finger coordination to a fairly stiff test. Just before ignition, and several times as the rocket is rising (and



At T – 15 and holding, you're awaiting NASA's "go ahead" to proceed in Apollo 18.

you're trying to keep the gyros balanced), a small bar-graph display lights up and moves from left to right. Your aim is to click at or near the moment the graph crosses mid-line. If the accumulated error—milliseconds from mid-line—exceeds allowed limits, or your left-to-right stick movement falters, thus losing the gyros, the mission is aborted.

Once in orbit, you employ four-quadrant steering to dock the command module to the lunar lander. You then move on toward the moon and a critical mid-course correction. The remaining sub-missions include Lunar Landing, Moon Walk (to reach the site of Surveyor III), Space Walk (a satellite retrieval experiment) and Re-Entry. Each offers special challenges, and, though you'll often have several tries (depending on fuel, oxygen supply, and so forth), there's a very real threat of a sub-mission abort.

Apollo 18 is an exceptionally well-planned, authentic-feeling simulation that features excellent sound along with a nice mix of realistic cockpit screens and colorful, animated sequences. Although successful completion of a mission dwarfs all other objectives, the comprehensive, NASA simulator-grade scoring system does supply useful performance feedback and a shot at recognition via the on-disk scoring record.

Admittedly, the game is a real toughie. Even with good documentation, mastering the various sub-missions takes a lot of practice. But it's also highly addictive and, because of excellent continuity, long-playing as well. It's perfect in a darkened room with headphones; just boot up Apollo 18 and get ready for some "far out" fun! *(Accolade, 20813 Stevens Creek Blvd., Cupertino, CA 95014. C-64/$29.95.)*

—Jeff Hurlburt
Houston, TX

Darkhorn ..... B

Fast Thinking
And Fast Acting
Required

When it comes time for an evening's entertainment, everyone has a favorite computer game. Some like arcade action games, and many enjoy solving adventures, while still others spend time working with wargames. Unfortunately for the last group, little innovative software is being produced to satisfy their voracious appetites.

Enter the Avalon Hill Game Company, long noted for its dedication to the board and computer wargamer. Darkhorn, a fantasy wargame, attempts to bring a fresh perspective to a worn-out genre.

The object of the game is fairly cut-and-dry—capture and occupy enemy towers. When you've taken three of four towers, the game is won.

Darkhorn is played in real time, so, depending on whether you select the short game or the full campaign, playing time can last anywhere from one hour to a full afternoon; and beware—idleness rapidly weakens a position.

A campaign can range over a number of different maps, each with its own towers to conquer. Wargames are never cited for their eye-boggling graphics, but Darkhorn map depictions are done rather well. And, when the supplied maps become a bit boring, random maps can be generated, making Darkhorn as replayable and refreshing as a wargame can be.

Crushing victory in Darkhorn is nothing but a dream until vast armies can be recruited and put into action. Raising these armies is an especially time-consuming process, as is deploying troops, gaining action points and travelling to the different types of terrain needed to recruit followers. The differ- ►

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ent types of warriors—archer, dwarf, human—have special qualities that make them more effective against dissimilar armies. Pressure stems from the fact that up to three computer or human opponents are doing this at the same time you are.

It's very difficult by simply studying the screen to keep track of which players are fortifying, recruiting or deploying troops. To overcome this, the designers have included special sound effects to aid you in determining what the other players are doing. Each selected action has a distinctive sound to it, and you'll soon know what's going on around the map by the unending parade of blurps and beeps coming from the monitor.

The only time a break in the action occurs is during battle, when two opposing players try to occupy the same spot. Gamers interested in strategy have the option of letting the computer decide a battle's outcome based on army size, bonuses and other factors. On the other hand, arena-style combat is available for those who are interested in victory gained by the sword. When this option is chosen, two knights representing opposing forces appear at the bottom of the screen and wage battle until a victor emerges.

Darkhorn's documentation is thorough, yet concise. It is an enjoyable escape into fantasy wargaming that will both frustrate and delight you. It's rather simplistic as strategy games go, but won't have you bogged down in the unnecessary details of war. *(The Avalon Hill Game Company, 4517 Harford Rd., Baltimore, MD 21214. C-64/$30.)*

—JOHN RYAN
BILOXI, MS

HALLS OF MONTEZUMA ... B+

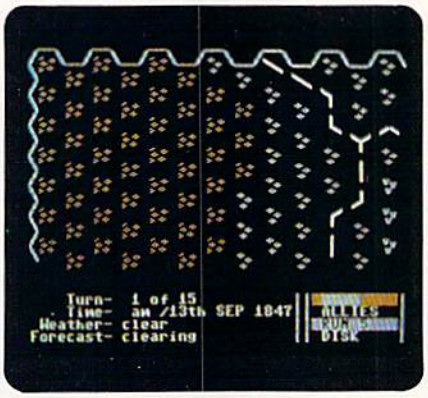
....To the Shores of Tripoli

Halls of Montezuma, a military simulation from the Strategic Studies Group, uses an enhanced version of the menu-driven command system developed for their 1986 hit, Battlefront. Montezuma lets you recreate eight of the U.S. Marine Corp's most famous battles, from the 1847 assault on Mexico City to the Battle of Hue during the 1968 Tet Offensive in Vietnam.

Battles can be waged against another human commander or by the computer controlling either side. Although 14 different types of battalions are represented in the game, orders are issued on a regimental level with each regiment having as many as four component battalions. Up to four regiments are grouped into each division, and the typical scenario places you in command of three divisions.

In some scenarios, "off the map" assistance is also provided in the form of support points that you can allocate to your regiments. This simulates the help the Marines would normally get from friendly air strikes or naval bombardments in advance of an assault.

Each scenario is played on the traditional, wargaming hexmap, using icons to represent the forces. The map



To see your entire battlefield in Halls of Montezuma, you must scroll through the on-screen map.

scrolls to reveal the entire battlefield, since you can see only a portion of the map on the screen at one time. In addition, the program comes with a large, full-color map that shows the locations of all scenarios and provides a key to the 26 types of terrain.

Terrain is just one of several factors that you'll have to consider in order to be a successful corps commander. The weather, time of day, condition of your troops and their supplies are also important to the outcome of any battle. Fortunately, several different types of reports are available to help you assess your current battle situation before issuing orders.

With two utilities—Warplan and Warpaint—included on the program disk, Montezuma lets you modify existing scenarios or design entirely new ones from scratch. The former is a military construction kit that lets you design and manipulate all of the forces affecting the battle, while the latter is an icon editor that you can use to create custom unit symbols and terrain.

Convenient game menu cards and an excellent manual could prepare even a novice to enter his first battle with little fear. Nevertheless, the game's strategic depth and variety of play options make it one that no serious wargamer will want to be without. *(Distributed by Electronic Arts, 1820 Gateway Drive, San Mateo, CA 94404. C-64/$40.)*

—BOB GUERRA
SOUTH BOSTON, MA

CHOLO C

Rescue the Survivors Of a Foreign World

The worst fears of mankind have come to pass. Your world, Cholo, has been completely destroyed by a nuclear holocaust. Nothing is left living on the surface of the planet. However, a colony of humans managed to escape the devastation and entered a specially prepared bunker where they and their descendants have been for over 500 years.

It was planned that when radiation levels were safe, the droids still on the surface would unseal the bunker and normal life would begin again. Unfortunately, a serious malfunction has ruined the communication system between the bunker and the droids.

Your job is to take control of the droids, one by one, and unseal the bunker. To complicate matters, because all human life is locked in the bunker, the droids are programmed to assume that anything moving is alien.

Cholo's graphics are very simple, but after playing an hour or so, you realize that they fit the mood of the game. This could be a very enjoyable game, but there are some problems that cause it to be quite frustrating.

The documentation leaves much to be desired. It includes a fairly extensive novel that gives the background of the holocaust and your mission, but no clear-cut instructions as to how you are to go about finding the droids.

Another problem I encountered was with the erratic control of the speed of the droids. In order to communicate with another droid, you must match its speed and then paralyze it. Once you have yours moving at full speed, sometimes it's impossible to slow it down, no matter how hard you pull the joystick or bang the key; yet, at other times, it seems to work perfectly. (I tried this on several computers to make sure it's a game problem and not a computer problem.)

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exploring the city, you can get down to the serious business of the mission at hand; and the game can become enjoyable and addictive.

If you like a challenge and aren't easily frustrated, here's a game for you. *(Firebird; distributed by Activision, 2350 Bayshore Parkway, Mountain View, CA 94043. C-64/$24.95.)*

—ART LEWIS KIMBALL
TUSCOLA, IL

DARK LORD ..... C+

Dare You Venture Into the Alterworld?

"After reading of your grandfather's adventures, you decide to venture through the looking-glass door to Alterworld. There you will challenge the monstrous Nequam, a jackal-hearted Warlord whose enchanted amulet makes him nearly invincible."

So reads the package note on this animated adventure, whose plot is similar to that of scores of other programs. Dark Lord's version of this tradition falls somewhere in between the truly inspired and the boringly trite.

To successfully complete a mission, a player must explore a crypt, a volcano and other exotic locales. Using objects gathered during the journey and information furnished by Alterworld residents, the adventurer solves a series of puzzles that finally lead to the destruction of Nequam.

The puzzles appear to be fairly typical of the genre and generally fall within a beginner's range of difficulty.

The game has three difficulty levels, which are primarily based on the location of objects needed to complete the venture. However, a player who finishes any of the three will probably find little challenge in the other two.

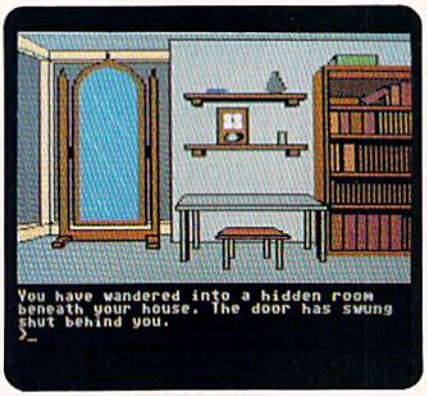
Dark Lord also includes a Mini Adventure, which can be played or viewed as a self-running demonstration.

The relatively unsophisticated parser omits such widely used options as linking a series of commands in one statement. However, it does have a vocabulary extensive enough to make finding the proper word for a particular situation comparatively easy.

Dark Lord boasts surprisingly impressive sound effects. Fortunately, the sensory frills do not delay the action. Smooth disk access produces quick transitions from one screen to another.

Still, Dark Lord gives primary emphasis to the visual. The limited animation in certain scenes is effective, and the other graphics are well drawn and appealing, although rather cartoonish. This is not a game that relies on an eerie occult atmosphere.

The software does have some rough spots. For example, when you enter instructions involving one object, the program occasionally produces a response to an entirely different command. Also, while the manual indicates that misspellings can be corrected without reentering an entire sentence, this isn't true in all cases.



One of the rooms you can explore in your quest to solve Dark Lord's puzzles.

Another possible problem is the lack of adequate assistance for a player who is stymied by a particular puzzle; unfortunately, a hint book is not available to aid adventurers.

On balance, however, the program's negatives are offset by its strong points. Especially considering its relatively low price, many players will find Dark Lord to be more appealing than many other graphics adventures. *(Datasoft; distributed by Electronic Arts, 1820 Gateway Drive, San Mateo, CA 94404. C-64/$19.95.)*

—WALT LATOCHA
OAK PARK, IL

STRATEGIST ..... C–

Take a Byte Out Of Wall Street's Bulls and Bears

How do you make money in the stock market? Everyone knows the answer to that question—you buy low and sell high. When do you buy or sell a stock? If you can answer that question, you'll make a fortune.

Strategist is a market-timing program that claims it can catch upswings and avoid downswings in selected stocks. It does so by using a basic trading system: If the stock reaches a low and then rises by a certain percent, Strategist says "buy." If the stock reaches a high and then drops by a certain percent, Strategist says "sell."

The theory behind Strategist is simple: An investor can make a lot more money by buying and selling the same stock over and over again than he can by buying and holding on to the same stock. Stocks rarely move in a straight line; there are peaks and valleys within any trend.

Strategist buys a stock during a low, sells it at the next high, buys it back at the next valley, and so on. The program doesn't compare one stock to another, nor will it advise you on which stock to buy. It merely tells you the best time to buy and sell a stock that *you've* selected.

Can Strategist make you a millionaire? It's unlikely. There are some shortcomings with the program that indicate it might be easier to make money the old-fashioned way—by earning it.

The main problem is the program's inability to use stock quotes downloaded from online services. This means you must painstakingly enter the material yourself. And since Strategist recommends using a four-year history of quotes, that can be a considerable amount of work. Even worse, many of the major quote services, like Dow Jones, don't carry stock-price information more than a year old. If you want to use Strategist on more exotic investments like commodities or mutual funds, it means hours and hours of microfilm viewing at your local library, which would hardly be worth the effort.

In addition, the program uses quotations at weekly intervals, which is inadequate. As we saw last October, the Dow Jones Average can move 1000 points in one week's time.

Finally, the documentation is poor. The program calls for some user-entered variables, but the author never explains what many of them mean. Instead of values with significance, they become merely random numbers.

The Strategist does do some useful calculations, and it is based on a theory that many experts believe in. But because of the program's shortcomings, it can only be recommended for those who have plenty of spare time on their hands—and spare cash in their wallets. *(Strategy Software, 909 Carol Lane, Fairbanks, AK 99712. C-128/$29.95.)*

—PETER KING
EAST MEADOW, NY ■

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Time to dust off every dirty trick you know. Shove. Pass. Dribble. Trip. Break all the rules for kicks.

Pick a team from a rakish roster of nine neighborhood kids who are anything but neighborly. They'll do anything to win. Forget fairness. This ain't croquet.

Play on a grassy, but slippery park.

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Or take your licks on a rough city street.

To score a goal, you'll need to pass, slice, hook, head (not to mention a timely trip or two), just to stay one step ahead of your opponents.

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It's back. *Street Sports™ Baseball.* Our major league hit from last year.

There're makeshift diamonds. Bases made from spare tires. Trash cans to avoid. Bushes. Rocks. And chain-linked fences.

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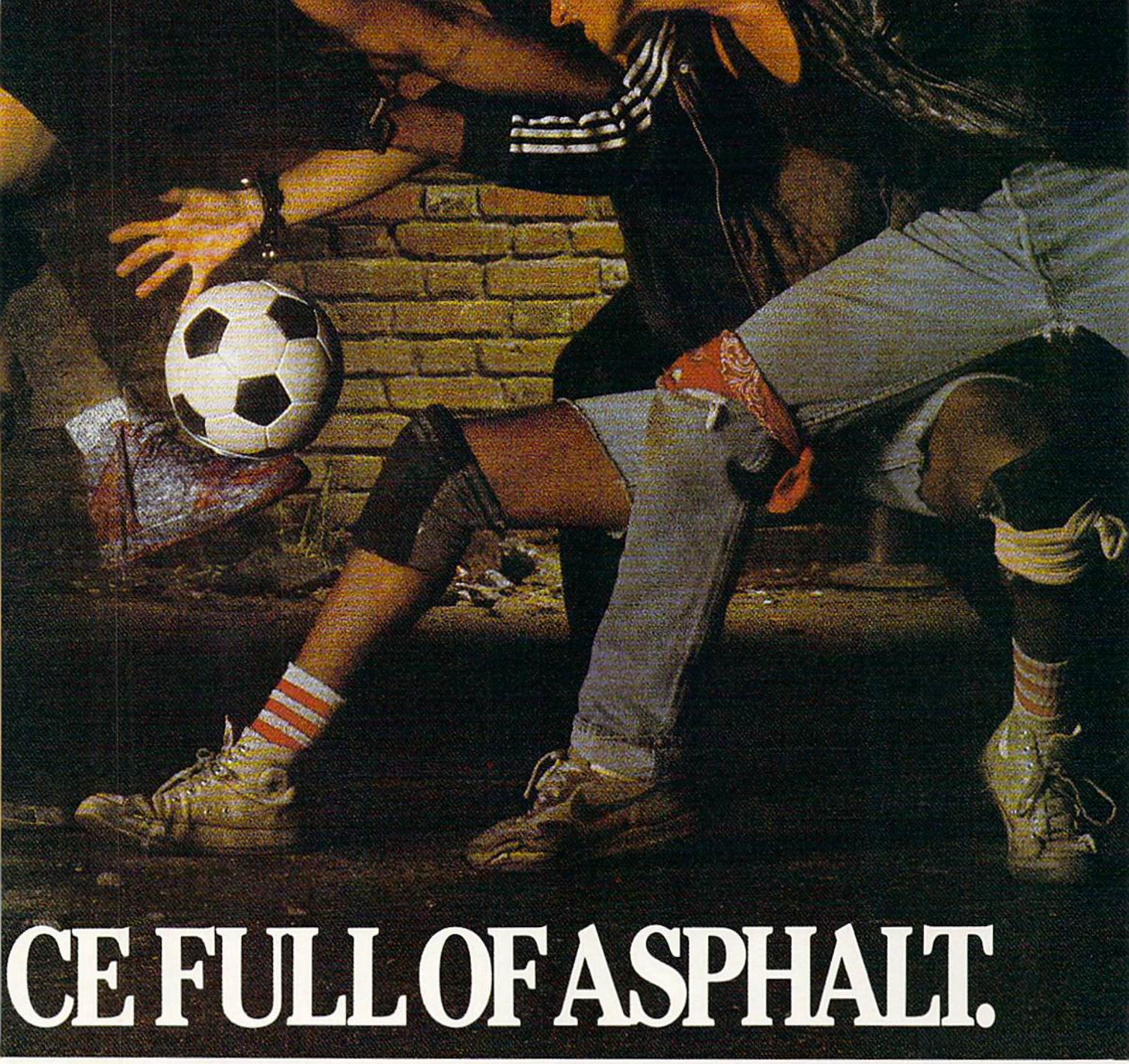
You pick the place. The players. The teams. The positions. The strategy. And then, you'll

Circle 12 on Reader Service card.



CE FULL OF ASPHALT.

be right in the middle of it all. With a split-screen view from above and up close.

Street Sports Baseball. It's the best seat in the house. Your house.

STREET SPORTS BASEBALL

SO HAS BASKETBALL.

It's back, too. The same dingy alleys. Scruffy playgrounds. Dark parking lots. You'll pick three-on-a-side from the neighborhood's ten toughest players.

Hot shooters. Slow dribblers. They're all here. The one with the great hook. The one who shoves underneath. The one who tugs at jerseys.

Pass to the big man inside. Hit the guard coming across. Screen the lanky forward. Bounce the ball off the chainlink fence. But watch out for the oil slick. In *Street Sports™ Basketball,* anything can happen. And often does.

Street Sports Soccer. Street Sports Basketball. And *Street Sports Baseball.*

Take a walk on the wild side.

STREET SPORTS SERIES BY EPYX

Commodore 64/128, Apple II & compatibles, IBM & compatibles, Amiga

Circle 12 on Reader Service card.

RUN
GOTO
INPUT
IF
FOR
OPEN
REM
REM
THEN
THEN
END
LIST
NEXT
NEXT
PRINT
CLOSE

10 GOTO PROGRAMMING
20 IF YOU'VE NEVER TRIED PROGRAMMING THEN READ LINE 40
30 REM: BY JIM BUTTERFIELD
40 PROGRAMMING IS FUN PROGRAMMING IS DULL; IT'S CREATIVE OR MECHANICAL; IT'S EASY OR COMPLEX.

Programming skills are vital to the effective use of a computer or they're quite unnecessary. What's the real story? Should you learn to program, and, if so, in what language and where can you look for help?

Well, there are several reasons to learn programming. Maybe you need a software program you can't find anywhere; or programming skills might boost your career; or perhaps you'd like a more secure feeling as a computer user. I know a computer scientist who calls users "victims," and if you don't have programming skills, that may be exactly how you feel: a victim of other people's programs. If you understand programming, you can look at a listing to see what it does and even update or correct it, if necessary.

Of course, programming is also just plain fun and satisfying. It's fine mental exercise, and, when your program is complete, you feel a great sense of accomplishment.

Programming Languages

Programs consist of a series of instructions that tell the computer what to do, and for the computer to understand these instructions, they must be in the form of numbers. For example, the codes 103 and 141 might mean "add" and "store," respectively. However, such *machine language* code is hard for people to write and read. To help us, higher-level languages have been developed so we can describe the job we want done without having to deal directly with the computer's code.

When you write a program using one of these higher-level languages, it must be translated into machine language before the computer can execute it. Some high-level languages, such as Basic, use an *interpreter* to do this, and the program is translated as execution proceeds. Interpreted programs don't run at maximum computer speed, but they start right away and you can easily stop and change them if needed.

In languages such as C, a *compiler* translates the program before execution. That means a delay in starting, and making changes to the code is more difficult, but a compiled program runs fast.

As you work with computers, you'll hear a lot about other languages, with each enthusiast claiming that his or her favorite is the best. However, there really isn't any "best"; each language is suited to certain types of jobs and has its own merits and limitations.

Machine Language and Its Relatives

As I've mentioned, machine language is the code the computer actually uses to do its work. It's fast and flexible, but machine language programming calls for extremely careful attention to detail, plus an understanding of the way the computer works. This last requires a knowledge of the binary number system (based on the powers of 2), which is used in the code that transmits direct operating instructions to the computer, and hexadecimal (base 16) notation, which programmers use as a compact way to represent binary values. ►

ILLUSTRATED BY PAUL YALOWITZ

Some languages are cousins of machine language, with speed and flexibility as their main objectives. *Assembly language*, for example, is close to machine language, but more helpful to the programmer. *Forth* is, in one sense, a collection of prewritten machine language routines that can be used as building blocks to quickly create a program. *C* language might be considered a shorthand way to define the machine language task you want performed.

Basic—which stands for Beginner's All-Purpose Symbolic Instruction Code—is the best-known programming language for microcomputers and the one you'd probably use in your initial programming adventures. Its popularity has generated a rich roster of resources you can call on: books and magazines, a wide assortment of programs to study and lots of Basic-literate users you can call on for help.

Basic also lets you try things out. If you're not sure what your computer will do with 2 plus 3 times 4, just enter PRINT 2 + 3*4 and see what you get. (Hint: Basic does multiplication first.) If your program isn't behaving correctly and you suspect it's somehow gotten the value of variable X wrong, stop execution and enter PRINT X to make the computer reveal exactly what's going on.

Many experts feel that easy-going Basic encourages sloppy programming, so other languages have been constructed to ensure good style. *COMAL* is a tightly controlled Basic variant that supports fast program execution, while remaining friendly to the programmer. *Pascal* and *Modula-2* require even more exact coding, but result in highly structured programs that are likely to be quite free of bugs.

You have a large choice of languages, but the chances are that the one you'll learn first is the one your friends use. That way, you can get help, and you'll have someone to swap notes and share experiences with. For most users, of course, that means good ol' Basic.

Table 1. Some books on Basic programming.

Machine Language for the Commodore 64, 128 and other Commodore Computers by Jim Butterfield, $14.95
Assembly Language Programming with the Commodore 64 by Marvin DeJong, $14.95
Brady Books, Prentice Hall Press
Simon & Schuster, Inc.
200 Old Tappan Rd.
Old Tappan, NJ 07675

C-128 Basic 7.0 Internals, $24.95
C-128 Basic Training Guide, $16.95
Machine Language for the C-64, $14.95
Advanced Machine Language for the C-64, $14.95
Abacus Software
5370 52nd St. SE
Grand Rapids, MI 49508

128 Machine Language for Beginners, $16.95
Compute! Books
825 7th Ave.
New York, NY 10019

Getting Started

How can you learn programming? The first steps are the hardest, partly because of the "buzzword barrier"—having to learn all those fearsome computer terms. Just remember that those words that initially seem obscure really represent simple events. For example, Syntax Error just means that, through some slight mistyping of a command, you've given the computer an instruction it doesn't recognize.

You can use books to get started with programming, and your local bookstore probably has many volumes to choose from. Browse through them to find one that suits your reading style. You may want a text that's gentle and contains many examples and illustrations, or you may prefer an intensive work that's packed with facts and covers a lot of ground. You might even at first prefer books written for children; these are often good for grown-ups, too, since they assume you know nothing to begin with. If you don't live near a bookstore, you can select a book from the list in Table 1 in this article.

Local community colleges and user's groups often offer classes in computer programming. These are good, especially since they provide a chance to ask questions and discuss problems with others. There are also computer classes given through many online networks, such as QuantumLink.

Even if you can't find a formal class, you can benefit from the knowledge of friends or user's group members. Most users will be glad to help when you get stuck, and you may be surprised at how quickly, in turn, you can assist more recent beginners.

As part of the learning process, it's a good idea to take simple programs written by others and modify them to behave in slightly different ways. You'll probably pick up programming pointers this way, and just seeing other programs in action may give you ideas for programs of your own. It's not unusual to hear a user exclaim, "I never thought of doing *that* with a program before!" Then they launch a project of their own based on a similar principle.

You'll find programs you can study and modify in magazines, on bulletin boards and in user's group libraries. Don't worry about being a pirate; you're looking for inspiration and methodology, not exact code. Magazine listings can be especially useful, since they're often accompanied by notes on the code.

Style

Good programming style involves following a few rules, three of which I consider especially helpful. First, make your programs "flow"—that is, hold together as units. A program that's fractured into ill-fitting parts hops around a lot, consuming memory and time in the process. You'll produce smooth programs, with few patches, if you plan carefully before you start writing.

I'd also recommend that you avoid obscure coding tricks; they'll probably end up by tricking you.

The best way to achieve good style, as far as I'm concerned, is to ask yourself, "If I say GOTO (another part of the program), do I really know where I'm going and why?" I fear that many programmers write a line such as GOTO 1800, just hoping they can figure out what to do when they get to that line. Such hopes seldom work out well.

Of course, these rules are meant to be helpful, not constraining. Programming is a craft in which you create personal "works of art," and ultimately you must do it your own way. Whatever way that may be, there's great satisfaction in being creative and great satisfaction in programming!

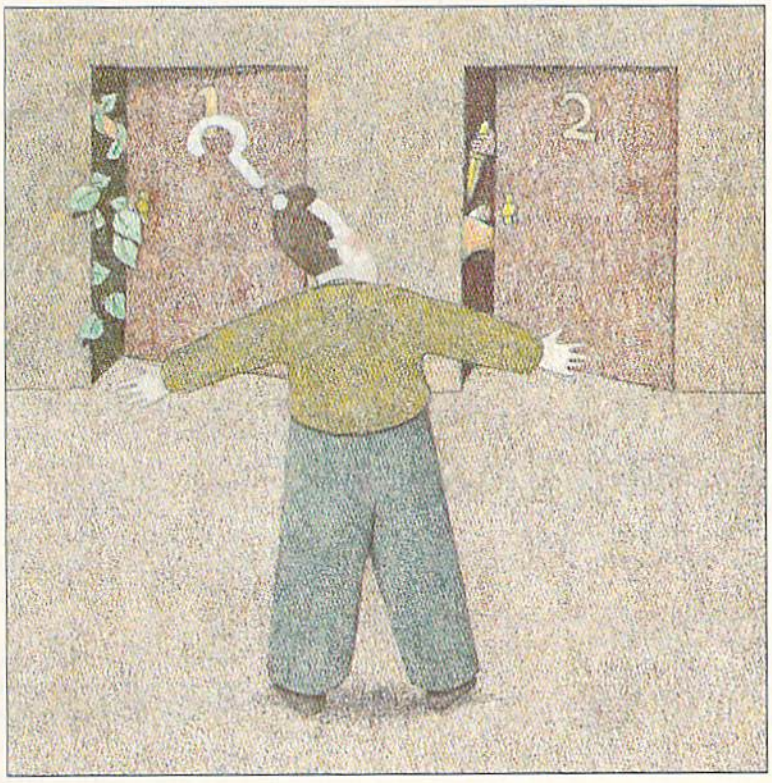
By the way, in Basic 2 + 3*4 equals 14. ■

Jim Butterfield, widely known as the guru of Commodore computing, has been a Commodore user and watcher for years. A member of TPUG (the Toronto PET Users Group), he is a well-known teacher, lecturer and writer on Commodore subjects. One of his latest books in publication is Machine Language for the Commodore 64, 128 and other Commodore Computers.

A Basic Adventure

Here's how to handle the vast amounts of data you need in programming an adventure game.

By CINDY HURLEY



ALL ADVENTURE GAMES tell a story. You, as the player, are the hero in the story, and your actions determine the outcome. For example, the game might take place in olden times in a castle that's threatened by a dragon, with you as the knight the king sends to drive the dragon away—or die trying!

Traditionally, adventure games contain no graphics. Like a good novel, all the pictures arise only in your imagination. As computer memory has become less expensive, some of these games have added illustrations, but most have used the extra memory available to create more elaborate plots.

All true adventure games have three features in common: first, they ask you to input words or sentences to determine your actions; second, they contain many different "objects," "locations" and "creatures" that you can visit or manipulate; third, they must handle huge amounts of numeric and string data to accomplish numbers one and two!

In this article, I'll show you some of the ways adventure game writers handle data and break down player input so the game can respond intelligently. I'll discuss arrays and pointers, and try to take some of the mystery out of these subjects. I'll show you how to structure a game, and, finally, I'll mention other applications for the techniques I've discussed.

ARRAYS

Arrays can be confusing when you first encounter them, but they provide a convenient method of shifting data around ►

inside the computer, and writing adventure games would be far more difficult without them.

Arrays are simply tables, or lists, of numbers (numeric arrays) or strings of characters (string arrays, so indicated by a preceding dollar sign) that you load into memory, usually in the initialization section of an adventure game program. Each item in the table has a position number that the game can use later as a pointer. For example, consider the following numeric table:

Position	Item
0	36
1	126
2	0
3	2009
4	-1

It's fairly obvious that using multi-dimensional arrays takes a lot of memory.

The numbers under "Item" are the elements, or members, of the array. The numbers under "Position" are the array index numbers, or pointers. If this table were loaded into an array called EX( ), then we could call up the fourth item by entering: PRINT EX(3). The computer would print out 2009. The number in parentheses tells the computer which item in the table we want.

Note that the first element, or first position, in the array is numbered 0, not 1. You don't have to put an item into it, but position zero automatically appears when you create the array. Many programmers ignore array element zero, as it's easier to reference numbers starting from number one.

Arrays can contain strings up to 256 characters in length. Following is an example of a string array:

Position	Item
0	Horse
1	Now is the time to go.
2	One two 3 4 five
3	"Now, why did you do that?"
4	Kitty cat

If this table were loaded into a string array called EX$( ) (read "EX-string"), then we could call up a desired item by referencing the position number. For example, PRINT EX$(1) would print out "Now is the time to go."

Notice that string arrays can contain both letters and numbers, and that strings can be of varying length within the same array. They can contain commas and Quote-mode characters such as CLEAR or even DELETE, as long as the strings containing them are placed inside quotation marks.

As you may already know, you create an array with a DIM (DIMension) statement, which tells the computer how much space in memory to set aside for the array. If you enter DIM EX(40), the computer sets up a numeric array of 41 elements (the first is number 0, remember). Until you put numbers into the array, it is filled with zeros. A string array is simply empty until you fill it.

An array can have more than one dimension. For a two-dimensional array, you could type DIM EX(40,2), which would produce an array analogous to a grid of 41 columns by 3 rows. You could also enter DIM EX(40,2,40) to create a three-dimensional array. It's also possible to create arrays with more dimensions, but you rarely need more than three for adventure games.

How does a multi-dimensional array work? Let's look at EX(40,2) as an example.

	Position	
First	Second	Item
0	0	100
0	1	-98
0	2	5
1	0	10000
1	1	4
1	2	88

etc., through 40,2

The first column under "position" represents the first number inside the parentheses, and the second column the second number. As you can see, for each number in the first column, there are three in the second. Thus the array EX(40,2) contains 41 times 3 (123) elements. To call up one of the elements, you must use both subscripts: for example, the value of EX(0,1) is -98. String arrays can also have more than one dimension.

It's fairly obvious that using multi-dimensional arrays takes a lot of computer memory, especially if you have them filled with long strings. This is probably the main disadvantage of using arrays in your programming. If you declare an array, and then don't use the entire space set aside—for example, if you declare DIM EX(40,40,40) and then don't use the zero elements—you're wasting a lot of the computer's data storage area.

However, arrays are very useful in adventure game programming. You can put all the room descriptions into an array, and then call them up by the room number of the player's location. You can put hundreds of words into an array, match this array with one containing codes, and use the words and codes to respond to the player's input. The locations and values of various "objects" can be put into a two-dimensional array, matched with an array of object descriptions, and used both to move the objects about in the game and to help keep score.

If you think it can get quite complex, you're right. Here are a few examples to help explain how arrays are used.

Let's assume you're writing a small adventure game with 20 "rooms" or locations that the player can visit. Each location must have a description that appears on the screen when the player "enters the room." To hold these descriptions, you dimension a string array: DIM RM$(19). Following is a table showing the first few room descriptions:

Position	Item
0	You are in the entrance to a large castle.
1	Here is the throne room. It is cold and stark.
2	This is a narrow hallway between tall windows.

and so on. . .

Now, let's say that you're keeping the player's position in a variable called PP. To print out the room descriptions, all you need do is PRINT RM$(PP). If the player is in room number 1, the computer screen will show "Here is the throne room. It is cold and stark." The variable PP is used as a pointer, to indicate the correct element in the array. We can change the value of PP as the player moves through the game, thus changing the value of RM$(PP) and, accordingly, the printed room descriptions.

To carry this further, let's assume that you have four "objects" in your game. These are items that the player can somehow manipulate: by picking them up, dropping them,

fighting them, or the like. (The exact actions will, of course, depend upon routines you write for your program.) Here is the list of the objects, their values and locations.

Object Number	Location	Value
0	1	100
1	10	80
2	5	0
3	8	100

The four objects are numbered from 0 to 3. The locations are the numbers of different rooms in your game. The value of each object is added to your score when you "get" or "kill" the particular object. Suppose the objects are: 1) Diamond, 2) Necklace, 3) Polar Bear, 4) Ruby. To keep track of these items, you must dimension and load two arrays.

I often use Data statements to load the arrays that contain my dictionary.

The first, OB(3,1), will be a two-dimensional numeric array for object locations and values. The second, OB$(3), will be a one-dimensional string array to hold the object descriptions. You can probably visualize OB$(3) fairly easily, but you might have trouble with the two-dimensional array. To clarify, here it is in table form:

Position		
First	Second	Item
0	0	1
0	1	100
1	0	10
1	1	80
2	0	5
2	1	0
3	0	8
3	1	100

Compare this with the table of object locations and values. You see that OB(0,0) holds the location of object number 0, and OB(0,1) holds the value of object number zero; OB(1,0) holds the location of object number 1, and OB(1,1) holds *its* value; and so on.

Now imagine that the player of your game "enters a new room" during the progress of the game. Remember that the player's current location is held in the variable PP, and that you print out the room descriptions by PRINT RM$(PP). You can also have a little loop that will check to see if any objects are present, and, if they are, print out a message. For example:

```
FOR Z = 0 TO 3
IF OB(Z,0) = PP THEN PRINT "THERE IS A " OB$(Z) " HERE."
NEXT
```

If the value of PP happened to be 1, then the screen would display "THERE IS A NECKLACE HERE."

These are just two brief examples of the ways you can use arrays in adventure game programming. One further use is in responding to the player's input, but I'll talk about that later on in this article.

Data Statements

Now let's discuss something I've barely mentioned thus far: loading arrays. Just how do you fill the large arrays needed for adventure games?

Data statements are one way to do this. You can type all the information into Data statements at the end of your program, and then execute For-Next loops to read the data into the arrays. For example, using the object variable we talked about before, OB(3,1), you could code as follows:

```
DATA 1,100,10,80,5,0,8,100
FOR X = 0 to 3:READ OB(X,0):READ
  OB(X,1):NEXT
```

This code's execution will fill the array with the proper values. OB(0,0) will equal 1, OB(0,1) will equal 100, and so forth.

Data statements are easy to use and are frequently necessary for loading arrays in adventure games. I often use Data statements to load the arrays that contain my dictionary (a long list of words) or my direction code (a long list of numbers.)

However, there are some problems with using Data statements. One is in getting the values in the statements to match exactly with the Read statements. If you leave out a value by mistake, the wrong values will load into the wrong places. Sooner or later, the program comes to a halt when it tries to read a string value into a numeric array. I've spent many hours staring at the monitor screen, carefully counting the numbers in long, jumbled lines, trying to discover which one I omitted.

A second problem with Data statements is that the values are put into the computer's memory twice. First, they are there as part of your program. Then, they're read into variable memory as part of the array. This takes up a lot of space inside your computer.

It's a shame that you can't easily access just the Data statements you want, and use them instead of using arrays. If you could find and read a particular Data statement, you wouldn't need to use more memory by reading the value into variable storage.

Actually, under certain circumstances it is possible to choose which Data statements the program accesses. As you know, the Restore statement moves the Basic data pointer back to the start of the first Data statement. Once the program has read all the data, it has to start back at the beginning. But, if your computer allows the use of Restore <line number>, you can go to any line you choose to begin reading the data.

For example, you could place all your data for room descriptions in a block starting with line number 1000. The description for room 0 would be in a Data statement in line 1000, that for room 1 in line 1001, and so on. In this circumstance, you would not need an array to hold the room descriptions. Your code would look like this:

```
RESTORE 1000
FOR Z = 0 to PP – 1:(player position, remember?)
READ DUMMY$
NEXT
READ RM$:PRINT RM$
```

This segment of code places the data pointer at line 1000 in the program. Then it reads data into a dummy variable until it comes to the line that holds the description of the room we want, as held in the variable PP.

Of course, reading all the lines until you reach the desired ►

How do you handle player input in an adventure game? The secret is the parser.

one can take a long time in a large program. Arrays are much faster. Also, the C-64 does not have the Restore <line number> command, although the C-128 does.

Assignment Statements

Assignment statements are among the first types we learn about in programming. Classic examples are LET X = 12 and Y = Y + 1. The first of these two statements assigns the value of 12 to the constant X. The second assigns the value of Y + 1 to the variable Y. LET is an optional keyword.

Assignment statements are frequently easier to use than Data statements for filling arrays. As you remember from our previous discussion, one of the problems with Data statements is making sure that the correct data gets into the right spot in the array, since it's difficult to keep track of the placement of values within the array.

This is not a problem with Assignment statements. For example, let's return to the room descriptions in your imaginary game program. If you had 40 rooms, your Assignment statements might appear as follows:

```
RM$(0) = "You are on a drawbridge in front of a castle."
RM$(1) = "You are in the moat! The water is green and slimey."
.
.
RM$(35) = "This is the Queen's dressing room. The walls are red
and
textured."
.
.
. . . and so on.
```

If you later decided to change the description for room 35, you could easily find it in your program by looking at the array subscripts. Also, you are absolutely sure of the values of the elements of the array. It would be impossible to get the description for room 1 into RM$(0) simply through leaving out a Data line somewhere.

Assignment statements do share one disadvantage with Data statements: the data is still in your program twice—once in the Assignment statement and then again in variable storage high in Basic memory. To avoid this problem, you can load the array values into memory from an outside source, leaving them out of your game entirely. I am referring, of course, to disk files.

Data Files on Disk

Sequential and relative files are two types of data files available for use with a Commodore disk drive. In sequential files, the data is stored one item after another, and you must access it in the same manner; to read one item you must read them all. Sequential files are easy to use and are suitable for loading adventure game arrays during the initialization phase of the program.

Relative files are written and accessed one record, or piece of data, at a time. You could, for example, store all your room descriptions in a relative file, then call the appropriate description off the disk as the player enters each room. This method of data access is relatively slow, however, since your game must wait for the disk drive at each move.

There are both advantages and disadvantages to using files. Keeping your data on disk certainly makes more memory available for your game. It's also much more difficult for the player to cheat, because he or she can't list the Data statements to get help on what to do next! On the other hand, a game that uses files can be tedious to debug, because every time the program stops with an error, you must reload the sequential files. You should also consider that editing the data and getting it to match properly with the array variables may give you gray hair.

If you do decide to use files, you might want to write a little filing program that will let you write and change the data files separately from the game. Alternatively, you could put all the data into Data statements as you program your game; then, when it's completely debugged, add a routine to write sequential files, move all the data onto disk and erase the Data statements from the program. This second method avoids many of the editing and matching problems mentioned above.

One final note on files: If you write strings to them, make sure they contain no commas! A file will lose everything that follows a comma, even if the entire statement is enclosed in quotes.

Handling Input

How do you handle player input in an adventure game? If you allow free-form input, as many games do, the player will type in sentences, such as TAKE THE DIAMOND, and the program must be able to understand and respond intelligently.

The secret to handling input is the parser, a Basic routine that breaks sentences into individual words the program can check for ones it recognizes. Clearly this is necessary, as no one could write a program that anticipates every complete sentence a player might enter.

Parsers can be simple or complex. In some commercial games, the parsers can break down long sentences and respond to several commands given in one input. The parser I'm going to discuss handles only one or two words at a time, which is all that's necessary for most adventure games. Once you understand how this one works, you'll be able to create more elaborate parsers for your own purposes.

Here's the code:

```
30 FOR Z = 1 to LEN(A$)
31 IF MID$(A$,Z,1)<>" " THEN NEXT:AB$(1) = "":AB$(0) = RETURN
32 AB$(1) = MID$(A$,Z + 1)
33 AB$(0) = LEFT$(A$,Z - 1):RETURN
```

You may not be familiar with the MID$ function as it's used in this parser. The format of MID$ is MID$(<string>, <number 1>,<number 2>), and it returns a substring of a string, starting at the position identified by the first number and going on for the number of spaces specified by the second number. For example, MID$("HELLO",2,2) yields EL. If you leave out the second number, MID$ returns everything from the character identified by the first number to the end of the string. For example, MID$("HELLO",2) yields ELLO.

The larger the array is, the more words your program will understand.

Our parser routine assumes that the player input is contained in variable A$. It then breaks A$ down into two segments, with the first word going into AB$(0) and the rest into AB$(1). Let's go over the routine line by line.

Line 30 sets up a For-Next loop that counts from 1 to the length of the input—that is, LEN(A$).

Line 31 handles the case of a single-word input. Basically, the For-Next loop is looking for a space character in the input. If it hasn't found one by the time it reaches the end of the loop, it puts the entire input into AB$(0) and returns to the main program.

If it does find a space, line 32 puts all the input that's to the right of the space into AB$(1). This could be a single word or a long involved sentence—the parser doesn't know or care. If you want the program to break down the input further, you must send the contents of AB$(1) back through the parser—A$ = AB$(1):GOSUB 30.

In line 33, the first word of the input is placed in AB$(0), and the subroutine ends.

The Binary Search

Once the program has isolated a word, it must decide what the word means in terms of available responses. In other words, the program must look the word up in a dictionary.

Remember our discussion of arrays? The program dictionary is merely a collection of words entered into an array from Data statements or from a sequential file during the initialization portion of the program. The larger the array is, the more words your program will understand. I frequently have up to 200 words in my program dictionaries.

For the word-lookup routine to work properly, each word in the dictionary must be the same length and in alphabetical order. You can enter the words in this fashion, or you can have your program adjust the word length and perform an alphabetical sort when you load the array. Adjusting the word length is fast and easy, but sorts can really slow down processing, so I usually enter the words in alphabetical order, but let my program adjust the lengths. Here's a word-lookup routine that makes the length five characters, counting spaces:

```
2000 FOR Z = 0 to 100
2010 READ WORD$(Z)
2015 WORD$(Z) = WORD$(Z) + "{5 SPACES}"
2020 W$(Z) = LEFT$(WORD$(Z),5)
2025 NEXT
```

This sequence of code adds four spaces to the end of each word as it's read from the Data statements, then it truncates the word to the first five characters. If the word was originally five or more characters, adding the spaces has no effect; but if the word was less than five characters long, the spaces pad it out.

Once you have the words in alphabetical order, all the same length and loaded into an array, you can find the one you want quickly and easily with a binary search—the fastest type of search, because it splits the number of words it must check in half with each pass through the list.

Here's how it works. Let's say we have 101 (0–100) words in our dictionary, and the word we're trying to find is in position 65 in the array. On the first pass, the search looks at word number 50. Since the number of our word's position is larger (farther along in the alphabet) than 50, the search throws out all the words from number 0 to 50 and continues to search only from word 51 through word 100.

Next it checks word 75, and since our word is "smaller," words 75 through 100 are thrown out, leaving 51 through 74. Word 62 is half-way between, and our word is larger than 62, so now the search looks from 63 to 74.

Number 68 is the new half-way point, and, since it's larger than 65, the routine next looks between 63 and 67. This time, the half-way word is 65, so the search ends. In this case, the binary search took five passes to find the word, but a search may take more. However many passes are needed, this type of search is always fast and efficient.

The binary search routine for looking up a word in an adventure game dictionary can be coded as follows:

```
40 G$ = AB$(0) + "{5 SPACES}":AB$(0)$ = LEFT$(G$,5)
41 K = 0:KK = 100
42 M = INT((K + KK)/2)
43 IF AB$(0) = W$(M) THEN Q = CD(M):RETURN
44 IF AB$(0)<W$(M) THEN KK = M - 1
45 IF AB$(0)>W$(M) THEN K = M + 1
46 IF K = M OR KK = M THEN Q = 0:RETURN
47 GOTO 42
```

In line 40, the routine adjusts the length of the input word to five characters, in the same manner as we earlier adjusted the length of the words in the dictionary. Remember, variable AB$(0) now holds only a single word.

Line 41 sets the limits of the search. This routine searches the dictionary array from subscript 0 (K) to element number 100 (KK).

Line 42 performs the binary split by adding K to KK, dividing the sum by 2 and putting the resulting value (truncated to the integer if K + KK is odd) into variable M. Since the values of K and KK change, the routine must perform this operation each time through the loop.

Line 43 compares the value of AB$(0) with W$(M), the word in location M in the dictionary. If there's a match, a code is set (I'll discuss the codes later), and execution leaves the binary search.

If there isn't a match, lines 44 and 45 see if AB$(0) is larger or smaller than W$(M). If it's larger, the bottom of the search is set to M + 1; if it's smaller, the top of the search is set to M – 1.

Line 46 checks to see if the entire dictionary has been searched without a match. If M is equal to K or KK, the code is set to 0 and execution goes back to the main program.

If the search isn't done yet, line 47 returns the search to line 42 to calculate a new value for M.

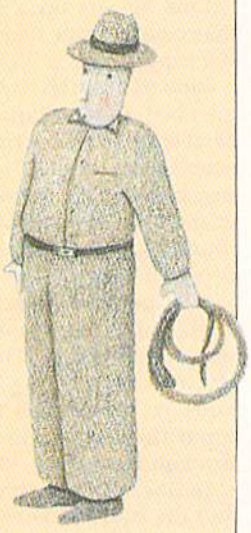
Directing Action Through Codes

So far, we've taken the player's free-form input (such as TAKE RING) and broken it into two words, then searched the game dictionary until we found the word TAKE. A match! ►

Sample listing of a simple adventure game.

```
10  GOSUB 900:REM INITIALIZATION
15  GOTO 500:REM MAIN LOOP
20  <VIEW THE LOCATION>
30  <PARSER>
40  <BINARY SEARCH>
50  <ANALYZE CODE>
100 <TRAVEL>
200 <TAKE>
300 <DROP>
400 <FIGHT>
    and so on for other actions
500 REM MAIN ROUTINE
502 GOSUB 20:REM PRINT ROOM DESCRIPTION
504 INPUT "YOUR MOVE "; A$
506 GOSUB 30:REM PARSER
508 GOSUB 40:REM BINARY SEARCH
510 GOSUB 50:REM ANALYZE CODE
512 IF NM(0) = 0 THEN PRINT "WHAT?":GOTO 504:REM NO MATCH IN BINARY SEARCH
514 ON NM(0) GOSUB 100,200,300,400
516 GOTO 504
    other possible routines here?
900 REM INITIALIZATION
905 REM TITLES, DIM ARRAYS, READ DATA, ETC.


1000 DATA....
```



But now, what do we do next?

The answer is, use a code. Each word in your program dictionary must have a matching code. The dictionary words are in one array, W$(100), and the codes are in a matching array, CD(100). If W$(14) in the dictionary held ENTER, CD(14) would hold the matching code, perhaps the number 111. When the binary search finds a matching word, it also finds that word's code, then places the code into variable Q and returns Q to the calling routine. What happens there is up to you.

Here are some possible codes:

Word	Code
NORTH	100
EAST	101
SOUTH	102
WEST	103
TAKE	200
DROP	300
KILL	400

If you used these codes, the first digit (in the hundreds place) would send your program to the proper routine. The following digits would direct the program further once it had reached that routine. So the player's choices would determine what happens and where he goes next.

To this point, I've covered the most difficult concepts and code in adventure game programming. The rest of the secret of writing an adventure game is in organization. If your program has good structure, it will practically write itself.

Structuring Your Program

Many people program like they read a book: They just start at the beginning and keep going until they reach the end. This may be the best way to get through a novel, but it's not the best way to create a complex adventure game. A game with poor structure is inefficient, using up unnecessary memory and being almost impossible to debug.

What do I mean by good structure? It's grouping all the code for a particular activity in one place. Put all the Data statements together; assemble all the code that handles input; group all the code for taking objects; and so on for the player's every possible action. The adventure game program should always cycle through a main-line routine that takes the player's input and branches off to subroutines accordingly.

The listing at the top of this page is the shell of a very simple adventure game. The routines I've already discussed are indicated by their titles. I also indicate other routines you could include if you were to write a game using this shell. The main routine appears in more detail.

As you can see, the main routine merely takes the input and branches to various routines. The program is always using the same routines for the same purposes and returning to a central place to await the next input.

The initialization routine and Data statements, which are used only once, go at the end of the program, so Basic doesn't have to look at them more than once. By the same token, routines that are used often should go at the beginning of the program, so Basic needs to scan fewer lines to find them.

Broader Applications

While I've been discussing adventure game programming in this article, the techniques involved can be used in other types of programs as well. A parser is useful in any program that allows free-form input; Data statements, arrays and binary searches can be used in many types of programs; and all programs should be structured. In fact, most colleges teach only structured programming languages, and many businesses insist that their programmers follow structured techniques.

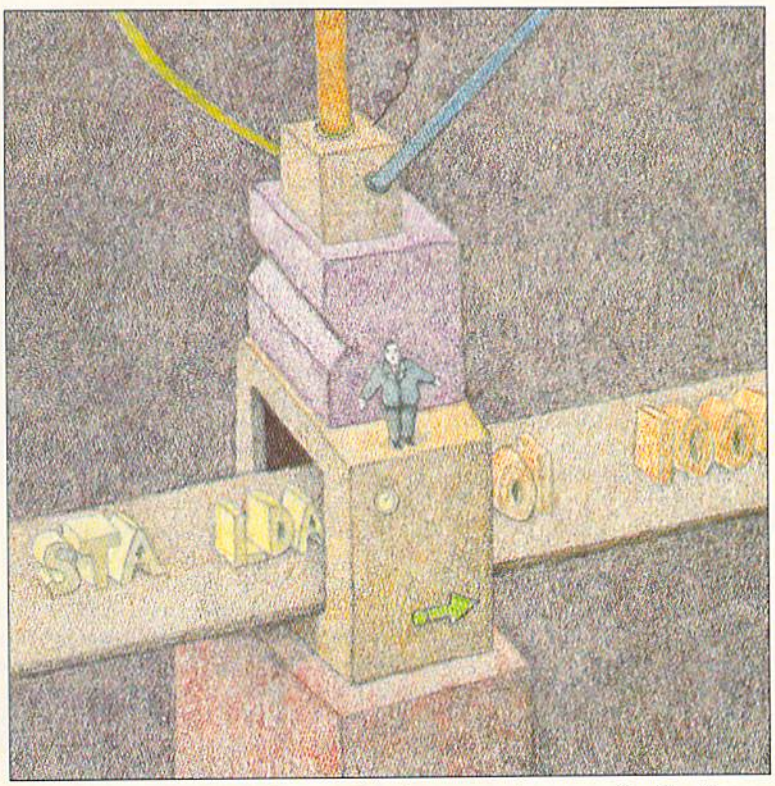
Whenever you write a program, keep these techniques in mind. You'll be a better programmer for it. ■

Cindy Hurley, a microbiologist working at the University of Florida, is also a computer programmer who particularly enjoys creating adventure games.

The Assembly Line

An assembler is an effective tool for adding speed and versatility to your programs.

By MICHAEL BROUSSARD



BASIC, THE LANGUAGE that comes built into the C-64 and C-128, is easy to learn and use. However, there are some applications where Basic isn't appropriate, either because it isn't fast enough or because the programmer needs access to parts of the operating system not available from Basic. For maximum speed and control of your Commodore, you must program in machine language (ML, for short). But, what exactly is ML?

The "brains" of the C-64 and the C-128 are microprocessors. Each microprocessor is controlled by a set of *machine instructions* that let it read from and write to memory, add, subtract, branch and perform other fundamental operations. When you use machine language, you are directly controlling the operation of the microprocessor. When you use Basic, on the other hand, you are writing programs in a high-level language that must first be "interpreted" into machine language so the Commodore microprocessor can execute it. Basic is, in fact, a sophisticated ML program that's built into the Commodore.

True ML programs are just strings of numbers and are difficult for people to read. For example, consider the following Basic statement, which displays the word HELLO on the screen:

```
PRINT "HELLO"
```

Now, here's the hexadecimal representation of an ML ►

program that does the same thing. (It assumes that the word HELLO is stored in memory starting at location 49152.)

```
A2 05 A0 00 B9 00 C0 20 D2 FF C8 CA
D0 F6 60
```

As you can see, it's exceptionally difficult for a human being to program in a language like this. For this reason, assemblers were developed. An assembler is a program that lets you use understandable abbreviations (called mnemonics) instead of numbers, to specify microprocessor operations and refer to memory locations using symbolic names.

The machine language program appears again below, shown in the mnemonic form that is expected by most assemblers. Comments appear at the end of each line, following the semicolon.

```
        LDX #5          ; number of chars
        LDY #0          ; string index
LOOP    LDA MSG,Y       ; get a char of string
        JSR $FFD2       ; print it
        INY             ; point to next char
        DEX             ; decrement counter
        BNE LOOP        ; branch if not 0
        RTS             ; exit ML program
MSG     .TXT "HELLO"
```

In this article, I'll survey five assemblers currently available for the C-64 and C-128. However, before jumping into the features of the programs, I want to describe assemblers in general.

Assembler Features

An *editor* is a tool that assists you in creating, saving and modifying programs. The C-64 and C-128 come with simple, built-in editors. Whenever you type a line that begins with a number, the editor assumes it's to be added to the program in memory and inserts it in the correct order, based on the line number. ML programs tend to have shorter lines than Basic programs, but more of them, since each line of ML code typically represents a single machine instruction and its operands.

In ML programming, it isn't unusual to want to insert, delete or copy many lines at a time—a potentially tedious task with the built-in editor, especially on the C-64. For this reason, many assemblers, including several of those I'll survey here, have their own editors, with features designed to assist in ML programming. Some use the Basic line editor as a starting point and add commands to make writing ML programs easier. Others provide a full-screen editor, so you can use the cursor keys to scroll through your program.

All but one of these assemblers support *macros*, in which an entire set of frequently used instructions is associated with one name. Wherever in your program those instructions are required, you place the macro name instead. The instructions that make up the macro are assembled into the program when the macro is referenced.

Macros can incorporate parameters, which make them very powerful. For example, consider the following code for defining a macro that increments a two-byte pointer. Each assembler uses a different syntax for macros; this is a Merlin-style example. (For those among you who are already familiar with machine language, the colon is correct; it's appended to the opcode to tell Merlin to use absolute addressing.)

```
DINC MAC        ; define a macro called
                  DINC
     INC: ]1    ; parameter gets sub-
                  stituted for ]1
     BNE * + 3
     INC: ]1 + 1
     <<<        ; end of macro DINC
```

Once this macro has been defined at the beginning of your assembly program, you can use it to increment any two-byte pointer. For instance, to increment a pointer called PTR, you'd include the following instruction in your program listing:

```
>>> DINC PTR
```

This line would be expanded during the assembly process into the following set of instructions:

```
INC: PTR
BNE * + 3
INC: PTR + 1
```

Careful use of macros can make your ML programs shorter and a lot more readable.

Conditional assembly is the ability to turn assembly on or off for part of your source program, based on, say, the value of a variable or the type of parameter passed to a macro. This feature is useful for a program that must generate slightly different code for different situations. For example, you might design a program destined to run either on a C-64 or a C-128. By setting a flag at the beginning of the program and using conditional assembly, the same source code could be used to generate ML tailored to either machine, thus saving you the trouble of maintaining two separate versions of the program.

Instead of pure ML, some assemblers can generate *relocatable code*, a special intermediate code that must be placed in RAM by a separate utility called a *loader*. This feature is very convenient when you have a long ML program you'd like to move around in memory without having to reassemble it every time.

Assembler packages often include other utilities. A *machine language monitor*, for instance, is a tool for viewing an ML program in RAM. It lets you examine the machine registers and the contents of memory, and set memory as well. Monitors are typically used in debugging ML programs. They're not as important in assembler packages for the C-128, as it has its own monitor built in.

Unassemblers are programs that attempt to build an ML source program from the contents of RAM, thus "reversing" the assembly process. These tools are handy when you accidentally lose the source for an ML program or when you wish to examine someone else's ML program to figure out how it works.

Conversion tools are programs that take a source program written for one assembler and convert it to the source format expected by another.

Now, let's look at the more interesting characteristics of five assemblers for the C-64 and C-128. A chart summarizing

Careful use of macros can make your ML programs shorter and a lot more readable.

And the Latest . . .

TWO NEW ASSEMBLER SYSTEMS have come to our attention right before press time. Just released is geoProgrammer, a GEOS-based assembler for the C-64 from Berkeley Softworks, and Commodore's C-128 Developer's Package will soon appear.

geoProgrammer

GeoProgrammer is the first assembler package designed for use with the GEOS operating system, and should make development of new GEOS applications much easier. It consists of a complete development environment, including three utilities: geoAssembler, geoLinker and geoDebugger.

GeoAssembler lets programmers create assembly source code using geoWrite, and it accepts actual graphics images within the geoWrite source code, where they're converted directly into usable program data. Considering that GEOS is a graphics environment, the importance of this feature can't be overstressed. This utility also offers macro facilities and conditional assembly, and it can handle up to 1000 label definitions per assembly module.

GeoLinker converts object code generated by geoAssembler into GEOS-executable programs. It also provides a way to create icons for the programs that can be used from the GEOS deskTop.

GeoDebugger lets you interactively follow the execution of a program created by geoAssembler, so you can find and remove bugs. Because this utility takes advantage of the RAM expansion unit (REU), you can debug programs that would normally take up the entire memory of the computer.

RUN will publish an in-depth review of geoAssembler in an upcoming geoWatch column. If you just can't wait, geoProgrammer is available from Berkeley Softworks, 2150 Shattuck Ave., Berkeley, CA 94704, for $69.95.

The C-128 Developer's Package

From Commodore comes The C-128 Developer's Package for their 6502 microprocessor, probably to be priced at $49.95. This system is designed to run on the C-128, but it can be used for C-64 development as well. Occupying four disks, it's certainly the most extensive machine language tool kit I've ever used.

The CDP source code editor is an 80-column, full-screen editor called ED128. Based on mainframe screen editors, it allows full access to any spot on the screen with the cursor keys, plus paging forward and backward through text files, string searches and cutting and pasting text areas. You can access disk drives with any device number from 8 to 11, send your text to a printer and incorporate other text files in the one you're using. The editor allows up to 47K of text in the main buffer and another 47K in the paste buffer.

The CDP HCD65 Macro Assembler is similar to the mainframe assembler used to develop the C-128 operating system. In fact, one test of the HCD65 involved using it to assemble all the 128 ROMs. The HCD65 can handle hex, decimal, octal, binary and literal constants, global and local labels, and global symbols. It also offers extensive macro facility, with macros nested to any depth (limited only by memory). Finally, this assembler supports a wide range of conditional directives, which are used for assembling various sets of source code based on results of If/Else/End If decisions.

As powerful as CDP's editor and assembler are, it's the accompanying support software, utilities and documentation that really set this product apart. The software engineers at Commodore (the people who designed the C-64 and C-128 and work daily on them and their peripherals) have provided pages of documentation on the differences between the various ROMs used in the C-64, SX-64, C-128 and 1571 drive, plus a sprite editor, character editor and a SID (sound interface device) editor for developing software on the C-64 and C-128. Not one, but three completely different 1541 fast loaders are also supplied for use in your programs, complete with source code and documentation.

You'll also find support routines for Commodore's 1764, 1700 and 1750 RAM expansion cartridges. With these routines, you can determine the size of available RAM, then stash data in the RAM and fetch it out again. The official Commodore RAMDOS software is included, as well.

CDP supports the Commodore 1351 mouse with two machine language routines, one for use from Basic and the other from assembly language. It also makes programming the 1571 and 1581 disk drives easy, because the source code and documentation for the routines that access the high-speed Burst modes (for use on C-128 and C-128D systems) are provided. You'll find routines for compacting and uncompacting data, as well. These are useful functions, and quite difficult to write.

Finally, The C-128 Development Package includes complete documentation on the C-128 Basic 7 math routines. These valuable ROM routines are user-callable.

If you're planning to use a C-128 to write assembly language software for either the C-64 or the C-128, this is the package to use. R

—Lou Wallace

the basic features of these programs appears in Table 1. In Table 2, you'll find a list of manufacturers and prices.

C-64 Assembler Development System

One of the oldest C-64 assemblers on the market is the one produced by Commodore itself. It adds commands to the standard Basic editor, allowing you to renumber and delete line ranges. It supports macros, and the package includes a monitor to assist with debugging. This is one of the slower assemblers, because the source code must be read in from disk twice and because an intermediate form of machine code is stored on disk during the second pass. This intermediate code must be poked into RAM later in a separate load step. Since there's no option to assemble directly into memory, the assembly process can take a long time if you're using a 1541 disk drive.

The only trouble I had with this package occurred when I tried to direct a listing to a non-Commodore printer: the system locked up. I'm not sure if the problem lies with the printer or the interface. The quality of the documentation is fair.

Merlin

Merlin is a powerful macro assembler that comes in two versions—one for the C-64 and one for the C-128. They are similar integrated packages that look like whole new mini operating systems. When booted, Merlin presents a menu of options for doing such things as entering the editor or monitor and loading or saving source files. Merlin 128 comes with its own high-quality, full-screen editor. The C-64 version includes a slightly less sophisticated, line-oriented editor, but a full-screen version is provided on the source disk and can be loaded and run on demand.

Both editors make entering assembler source code a breeze ►

by automatically tabbing from label to opcode to operand fields when you press the space bar. Macros can be nested in up to 16 levels, and the source disk comes with a library of useful examples. The documentation is excellent.

The Better Working Power Assembler

The Better Working Power Assembler, from Spinnaker, is an interesting package: For one low price, you get both a C-64 and a C-128 version, plus both a modified Basic editor and a full-screen editor. Although it doesn't support user-written macros, BWPA comes with a few built-in, macro-like pseudo opcodes to handle routine chores like block-memory copy. Temporary, reusable special symbols allow for easier coding of short branches, which results in smaller symbol tables and even faster assembly. BWPA provides support for nonstandard 6502 opcodes using the generally agreed-upon mnemonic forms.

Provision is made for sending each byte of output to a user-specified subroutine during the second pass of the assembly process—a useful feature when you're burning an EPROM or want to direct the output to a device such as a tape cassette or modem.

The C-64 version of the assembler works well with Spinnaker's Programmer's Toolbox, which adds many useful commands to Basic, such as renumber, range delete, search-and-replace and DOS support. As a bonus, the C-128 version even contains a Z-80 cross assembler! The documentation quality is good, and it's fun to read.

Table 1. Summary of assembler features.

	ABACUS	COMMODORE	MERLIN	POWER	TSDS
Full-screen editor	No	No	Yes	Yes	No
Extended Basic editor	No	Yes	Yes	Yes	Yes
C-64 and C-128 versions	No	No	Yes	Yes*	Yes*
User-definable macros	Yes	Yes	Yes	No	Yes
Conditional assembly	Yes	No	Yes	Yes	Yes
DOS support	No	Yes	Yes	No	Yes
ML monitor	Yes	Yes	Yes	No	No
Unassembler	No	No	Yes	Yes	Yes
Format conversions	No	No	Yes	No	Yes
Relocatable code	No	Yes	Yes	No	No
Copy-protected	Yes	No	No	No	Yes

* Both versions included on the same disk.

Table 2. Manufacturers and prices.

C-64 Assembler Development System
Commodore Business Machines, Inc.
1200 Wilson Drive • West Chester, PA 19380
No longer distributed by Commodore; check with third-party distributors for price.

Merlin
Roger Wagner Publishing, Inc.
PO Box 582 • Santee, CA 92071 • C-64, $49.95; C-128, $69.95

The Better Working Power Assembler
Spinnaker Software Corp.
One Kendall Square • Cambridge, MA 02139 • $39.95

Assembler/Monitor
Abacus Software
5370 52nd St. • Grand Rapids, MI 49508 • $39.95

The Total Software Development System
Distributed by Briwall
PO Box 129, 56 Noble St. • Kutztown, PA 19530 • $39

Abacus

Another macro assembler for the C-64 is available from Abacus. Source files for this assembler are edited with the unenhanced Basic editor, which is a disadvantage for ML programs, where you often want to insert, move or delete ranges of lines. Fortunately, this assembler also works well with Spinnaker's Programmer's Toolbox. (Be sure to load the assembler *first*.)

Directing object code to disk or a printer is a little more complicated here than with most assemblers, as you must use Basic statements before and after the source program to manage the opening, closing and deletion of disk files and to open a channel to the printer. The disk is heavily copy-protected, so much so, in fact, that the first copy of the assembler I tried wouldn't load on my 1571, even in 1541 mode, and I had to write to Abacus for a replacement disk. Very good documentation accompanies the program.

The Total Software Development System

TSDS, from NoSync, is another powerful macro assembler—and more. The package comes complete with versions for the C-64 and the C-128, and, in addition to adding over 30 new commands to the Basic editor, it boasts DOS support, a built-in fast-loader, an unassembler and conversion tools. If you still don't think you've received your money's worth, TSDS also includes a sprite editor, a sound-effects editor and a character-set editor! The documentation is thin, but adequate.

Summary

All of these assemblers are good packages, so which is right for you? That, of course, depends on what you want to do with it.

The Commodore assembler has the advantage of being in widespread use, so ML source programs you run into are likely to be in that format. It is, however, the slowest program of the bunch, because it's disk-intensive.

Merlin may be the best all-around assembler in the group. It's certainly the easiest to use, due to its menus and well-thought-out editors, and it's powerful in terms of features.

The Better Working Power Assembler is fast and probably the best choice for programmers who want to do a lot of interfacing between ML and Basic. It also appeals to my hacker's instinct.

Although the Total Software Development System's documentation is sparse, the program has all the features a good assembler development system should, and it complements them with sound, sprite and character-set editors. This package might be a good choice if you want to write an arcade-style game, where sprites and sound effects are important.

All right, if you must know, my personal favorites are Merlin and BWPA. But your needs are probably different from mine. The information in this article should help you select the assembler that's best for your own applications. ■

Michael Broussard, a long-time RUN *author, is a systems analyst for Stratus Computer, a manufacturer of fault-tolerant super-minicomputers.*

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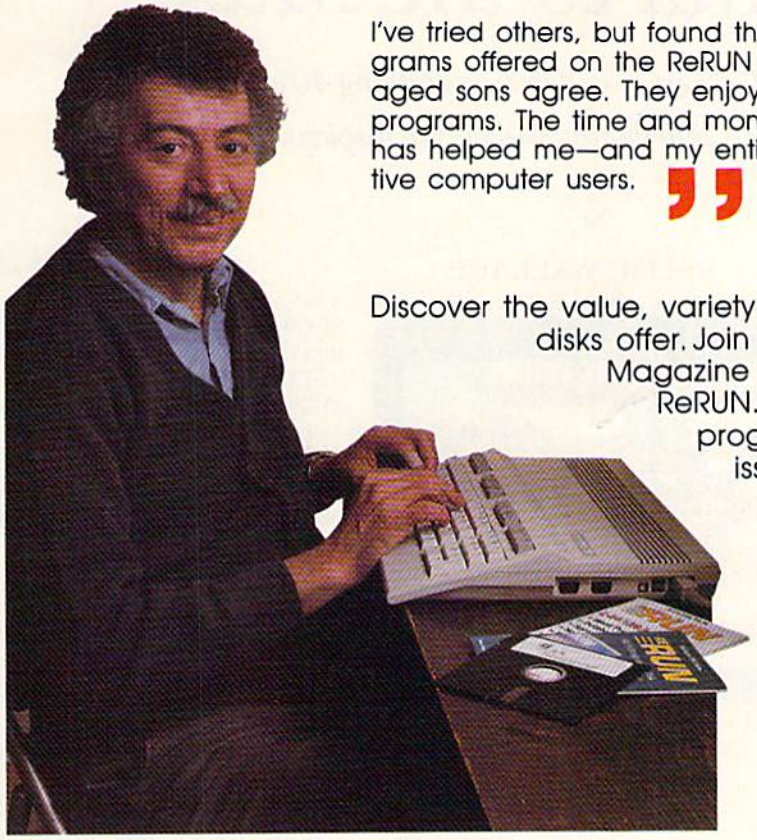

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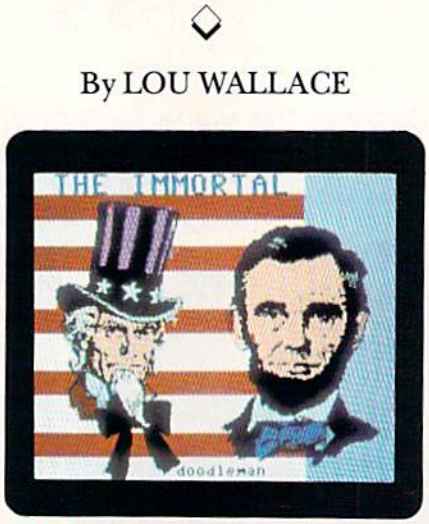

C-64 Doodle! screen image displayed in the C-128's 80-Column mode.

By LOU WALLACE

Commodore designed the C-128's 80-Column mode for text only, but the 80-column chip (the 8563 video display chip, or VDC) has many properties pure text doesn't exploit. Switch responds to this unfulfilled potential by letting programmers use Basic 7's drawing commands to draw on the 40-column screen, and then switch that screen to 80-Column mode for display.

Challenges of Switching

I met a number of difficulties in writing Switch. First, since the 40-column graphics screen is 320 dots wide and the 80-column is 640 dots, an image switched as is would cover only half the screen and look distorted. To make the display look the same in 80 columns as in 40, I made Switch stretch the width of the picture from 320 to 640 dots.

Another problem concerned RAM. To make a 640 × 200 color display with 8 × 8-pixel color cells requires 18,000 bytes. C-128Ds have 64K of VDC RAM, but flat 128's have only 16K (unless you've upgraded to 64K). To provide some RAM for color information, Switch creates a 640 × 176 display for 16K users. That means they can switch a 40-column screen only up to line 175, thereby losing 24 scan-lines of display space, but the benefit is worth the sacrifice. If you have 64K of VDC RAM, Switch creates a full 640 × 200 color screen. The program accepts a parameter (see below) that specifies how much RAM you have.

If you use the C-128's 80-column display, you may have guessed another problem I confronted in writing Switch: the fact that the 16 colors in the 40- and 80-Column modes are not exactly the same. Eighty-Column mode has two shades of cyan and two of purple, but no orange or dark gray. It also lacks brown, having a dark yellow instead. I mapped the colors as closely as possible, but, when switched, orange appears as dark purple, brown as dark yellow and dark gray as dark cyan.

There was no solution to the last challenge: that the 8563 VDC has no equivalent to Multicolor mode. With Switch, therefore, you may only use Graphic 1 (Hi-Res) mode.

Doodling

Besides graphics generated by your own programs, Switch will display Doodle! pictures. To use a Doodle! picture on the C-128, load it into memory location 7168 with a BLoad command, as in the following routine:

```
10 GRAPHIC 1,1
20 BLOAD "DDPICTURE",B0,P7168
30 GRAPHIC 5
40 SYS 2816,MD:REM SWITCH
50 GETKEY KE$
60 SYS 2819:REM 80-COLUMN GRAPHICS
   OFF
70 END
```

If you have hi-res pictures without color information, load them in directly at 8192, instead of 7168.

The Listings

Listing 1 creates the Switch machine language. Type it in (using *RUN*'s Checksum program), and save it with the name LIST 1. Only after saving it should you run it. This program creates the binary file called SWITCH that other programs can load.

Listing 2 is a simple demo of Switch that uses several Basic 7 drawing commands in several colors. If you have a C-128D with 64K of VDC RAM, change the variable MD to 1; otherwise run Listing 2 as is.

Switch resides at address $0B00 (decimal 2816) and includes two main routines. SYS 2816,mode is the switch routine itself, with the value of "mode" set at 0 or 1, depending on whether you have 16K or 64K of VDC RAM. SYS 2819 turns off Graphics mode and reinitializes the character sets and text screen attributes. R

Lou Wallace helped to break the color barrier for the C-128 in 80-columns by co-authoring Ultra Hi-Res, which demonstrated the first real 80-column bitmap graphics.

Listing 1. Switch machine language generator program.

```
0 REM C-128 SWITCH 40/80 - LOU
  WALLACE                  :REM*22
10 FORT=4864 TO 5782:READ D: CK
   =CK+D:POKET,D:NEXT   :REM*202
15 IF CK<>81909 THEN PRINT "ERR
   OR IN DATA STATEMENTS...":EN
   D                        :REM*10
20 BSAVE"SWITCH ",P4864 TO P578
   2:PRINTDS$               :REM*4
30 DATA 76,6,11,76,236,12,141,1
   04,14,173,0,255,141,151,14,4
   1,254,141,0,255          :REM*154 ►
```

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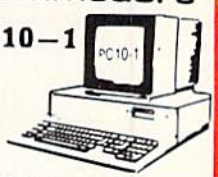

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```
40 DATA 173,0,214,41,7,24,201,0
   ,208,15,169,64,162,25,32,31,
   14,169,192,141          :REM*124
50 DATA 105,14,76,57,11,169,71,
   162,25,32,31,14,169,199,141,
   105,14,169,0,141        :REM*252
60 DATA 106,14,169,55,141,107,1
   4,169,64,141,93,14,173,104,1
   4,201,0,240,17          :REM*121
70 DATA 169,255,141,93,14,169,2
   08,141,106,14,169,62,141,107
   ,14,169,1,168           :REM*27
80 DATA 162,28,169,4,32,220,13,
   169,201,141,150,14,173,104,1
   4,201,0,208,5           :REM*161
90 DATA 169,177,141,150,14,173,
   147,14,141,92,14,173,146,14,
   141,91,14,169,0         :REM*119
100 DATA 141,94,14,141,95,14,14
   1,96,14,169,0,141,99,14,169
   ,0,141,100,14,32        :REM*73
110 DATA 213,12,173,91,14,133,2
   50,173,92,14,133,251,160,0,
   177,250,32,128,13       :REM*171
120 DATA 173,101,14,32,55,14,17
   3,102,14,32,55,14,165,250,2
   4,105,8,144,2           :REM*133
130 DATA 230,251,133,250,173,94
   ,14,24,105,1,201,40,240,6,1
   41,94,14,76,167         :REM*175
140 DATA 11,169,0,141,94,14,238
   ,91,14,173,91,14,201,0,208,
   3,238,92,14,238         :REM*67
150 DATA 95,14,173,95,14,205,15
   0,14,240,35,238,96,14,173,9
   6,14,201,8,208          :REM*46
160 DATA 22,238,92,14,173,91,14
   ,24,105,56,144,3,238,92,14,
   141,91,14,169,0         :REM*68
170 DATA 141,96,14,76,157,11,32
   ,31,12,173,151,14,141,0,255
   ,96,173,150,14          :REM*93
180 DATA 201,201,240,23,169,55,
   141,99,14,169,0,141,100,14,
   169,111,141,108         :REM*186
190 DATA 14,169,4,141,109,14,76
   ,81,12,169,208,141,100,14,1
   69,62,141,99,14         :REM*12
200 DATA 169,208,141,108,14,169
   ,7,141,109,14,32,182,12,173
   ,148,14,133,250         :REM*169
210 DATA 173,149,14,133,251,160
   ,0,177,250,141,88,14,32,26,
   14,168,185,126          :REM*255
220 DATA 14,141,89,14,173,88,14
   ,32,21,14,32,26,14,168,185,
   126,14,32,21,14         :REM*223
230 DATA 24,109,89,14,32,55,14,
   32,55,14,174,108,14,24,202,
   224,255,208,19          :REM*93
240 DATA 142,108,14,174,109,14,
   24,202,224,0,208,1,96,142,1
   09,14,76,168,12         :REM*136
250 DATA 142,108,14,230,250,165
   ,250,24,201,0,208,2,230,251
   ,76,94,12,162,18        :REM*163
260 DATA 173,99,14,32,31,14,162
   ,19,173,100,14,32,31,14,162
   ,12,169,0,32,31         :REM*202
270 DATA 14,162,13,169,0,32,31,
   14,96,32,49,13,162,25,32,43
   ,14,141,97,14           :REM*84
280 DATA 173,105,14,162,25,32,3
   1,14,32,111,13,96,32,49,13,
   162,25,173,97,14        :REM*254
290 DATA 32,31,14,162,20,169,8,
   32,31,14,169,0,162,21,32,31
   ,14,162,28,169,4        :REM*16
300 DATA 160,0,32,220,13,169,15
   ,160,192,162,39,133,2,132,3
   ,134,4,32,110           :REM*144
310 DATA 255,169,147,133,6,169,
   15,160,255,162,210,133,2,13
   2,3,134,4,32,110        :REM*115
320 DATA 255,96,162,24,32,43,14
   ,141,98,14,32,182,12,160,0,
   162,31,169,0,32         :REM*131
330 DATA 31,14,140,90,14,162,24
   ,169,7,160,0,32,220,13,162,
   30,169,255,32,31        :REM*50
340 DATA 14,172,90,14,200,24,20
   4,93,14,208,227,169,7,160,1
   ,162,24,32,220          :REM*37
350 DATA 13,32,182,12,96,162,20
   ,173,107,14,32,31,14,173,10
   6,14,162,21,32          :REM*166
360 DATA 31,14,96,141,103,14,16
   9,0,141,101,14,141,102,14,1
   60,0,173,103,14         :REM*40
370 DATA 24,10,144,20,141,103,1
   4,185,142,14,13,101,14,141,
   101,14,200,192,4        :REM*226
380 DATA 144,232,76,179,13,141,
   103,14,200,192,4,176,3,76,1
   41,13,160,0,173         :REM*96
390 DATA 103,14,24,10,144,20,14
   1,103,14,185,142,14,13,102,
   14,141,102,14           :REM*64
400 DATA 200,192,4,144,232,76,2
   19,13,141,103,14,200,192,4,
   176,3,76,181,13         :REM*19
410 DATA 96,141,84,14,142,85,14
   ,140,86,14,32,43,14,141,83,
   14,174,86,14,24         :REM*64
420 DATA 224,0,208,15,172,84,14
   ,185,118,14,45,83,14,141,83
   ,14,76,14,14,172        :REM*133
430 DATA 84,14,185,110,14,13,83
   ,14,141,83,14,174,85,14,32,
   31,14,96,10,10          :REM*181
440 DATA 10,10,96,74,74,74,74,9
   6,142,0,214,44,0,214,16,251
   ,141,1,214,96           :REM*53
450 DATA 142,0,214,44,0,214,16,
   251,173,1,214,96,162,31,142
   ,0,214,44,0,214         :REM*187
460 DATA 16,251,141,1,214,96,16
   2,31,142,0,214,44,0,214,16,
   251,173,1,214,96        :REM*227
470 DATA 0,0,0,0,0,0,0,0,0,0,0,0,
   0,0,0,0,0,0,0,0,0,0,0,0,0,0
   ,0,0,1,2,4,8,16         :REM*38
480 DATA 32,64,128,254,253,251,
   247,239,223,191,127,0,15,8,
   7,10,4,2,13,11          :REM*175
490 DATA 12,9,1,6,5,3,14,192,48
   ,12,3,0,32,0,28,177 :REM*69
```

Listing 2. Switch demo program.

```
10 REM DEMONSTRATION OF 40 COLU
   MN GRAPHICS IN 80 COLUMNS
                           :REM*103
20 REM BY LOU WALLACE   :REM*114
30 REM RUN MAGAZINE MAY 1988
                           :REM*243
40 BLOAD"SWITCH ",B0,P2816
                           :REM*238
50 REM DRAW ON 40 COLUMN SCREEN
                           :REM*125
60 MD=0:REM CHANGE MD TO 1 FOR
   64K VDC SYSTEMS         :REM*49
70 HT=175:IF MD=1 THEN HT=199
                           :REM*208
80 COLOR 0,1               :REM*221
90 GRAPHIC1,1              :REM*224
100 COLOR 1,6:BOX 1,0,0,319,HT
                           :REM*149
110 COLOR 1,2:BOX 1,8,8,100,50:
   CHAR 1,5,3,"BOX"        :REM*139
120 COLOR 1,3:CIRCLE 1,160,64,5
   0:CHAR 1,17,8,"CIRCLE"
                           :REM*147
130 COLOR 1,4:DRAW 1,8,120 TO 1
   60,120:CHAR 1,1,16,"LINE"
                           :REM*30
140 COLOR 1,5              :REM*46
150 FOR I=1 TO 20:X=RND(1)*50:Y
   =RND(1)*10:DRAW 1,204+X,96+
   Y TO 204+X,96+Y:NEXT:REM*97
160 CHAR 1,26,14,"POINTS"
                           :REM*176
170 COLOR 1,7:CIRCLE 1,270,72,2
   0,50,5,135:CHAR 1,35,14,"AR
   C"                      :REM*148
180 COLOR 1,8:CHAR 1,1,19,"BASI
   C 7 DRAWING COMMANDS IN 80
   COLUMNS"                :REM*123
190 GRAPHIC5               :REM*4
200 PRINT "READY..."       :REM*68
210 SLEEP 1                :REM*123
220 PRINT "SET..."         :REM*104
230 SLEEP 1                :REM*143
240 PRINT "GO!"            :REM*74
250 SLEEP 1                :REM*163
260 B=2816:REM ADDRESS OF ROUTI
   NES                     :REM*253
270 SYS B,MD:REM CREATE 80 COLU
   MN COLOR SCREEN FOR 16K C12
   8'S                     :REM*198
280 GETKEY A$              :REM*250
290 SYS B+3:REM RESTORE 8563 CH
   IP                      :REM*99
300 COLOR 5,16:COLOR 6,1:REM SE
   T SOME NICE COLORS      :REM*171
```

■

Learn To Walk Before You RUN

We receive many letters from new Commodore owners who want to type in program listings from *RUN* and need help in getting started. To answer many of the questions novice users have, we present the following guidelines.

1. First, keep in mind that as a beginner you should enter only short Basic programs. Avoid machine language listings and lengthy Basic programs until you get the hang of what you're doing.

2. To help you catch mistakes in typing in listings, we publish two checksum programs each month, called 64 Perfect Typist and 128 Perfect Typist. (Follow the directions in How To Type *RUN* Listings, elsewhere in this issue.)

3. If you intend to save the program you're typing in on a brand new disk, you must format that disk. To do this, insert the disk in your drive and type:

```
OPEN15,8,15 <press return>
PRINT#15,"N0:NAME,##" <press return>
```

The ## is a two-character identifier that can be any combination of letters or digits. NAME can be any title for the disk that you choose, as long as it's 16 characters or less.

After entering the above lines, wait for a few minutes while the disk spins inside the drive. When the disk stops, the formatting is done. Then type:

```
CLOSE15 <press return>
```

In 128 mode on a C-128, you can shorten this procedure by typing:

```
HEADER "NAME,##" <press return>
```

Caution: The formatting process erases any material already on the disk, so if you're formatting a used disk, make sure it doesn't contain any programs you want to keep. See item 11 below, on reading the disk directory, if you need to find out what's on the disk.

4. Before you start typing in a program listing, your computer's memory needs to be empty. To make sure it is, turn the computer off, wait a few seconds, and turn it on again.

5. As you type in the listing, remember to press the return key after each line. The return enters the line into memory.

6. If you want to review what you've entered, type LIST and press the return key; all the lines you've entered will scroll by. You can slow the scrolling on the C-64 by holding down the control key, and on the C-128 by pressing the no scroll key. To view certain specific lines, type LIST, followed by the line numbers you want; then press the return key. For example, LIST 10–50 displays lines 10 through 50, and LIST 20 displays only line 20.

7. If you find an error in a line, delete the incorrect characters with the insert-delete key, then retype that portion and press return to enter the new line in memory.

8. Be sure to save the program to disk fairly often during the typing process. Otherwise, you could lose all your work if a power glitch wipes out your computer's memory. To save a partial or complete Basic program listing, type:

```
SAVE "NAME",8 <press return>
```

In 128 mode on a C-128, you can press F5, type in NAME and press the return key. Here, NAME is the filename you want the program to have, not the disk name you used when formatting.

Each time you save a revised program to the same disk, you must change its filename, or a disk error will occur, even if only one character is changed. An easy way to vary the filename is by adding version numbers to the end of the basic name (Program.1 and Program.2, for example). The numbers will also tell you which version is the latest.

9. If you wish to erase (scratch) unwanted programs from a disk, type:

```
OPEN15,8,15 <press return>
PRINT#15,"S0:filename" <press return and wait a few seconds>
CLOSE15 <press return>
```

In 128 mode on a C-128, you can type:

```
SCRATCH "NAME" <press return>
```

Be sure not to erase the final version!

10. Always save the final version of a program to two disks, so you have a backup copy in case one of the disks gets damaged. When saving to two different disks, you can use the same program name in each case.

11. To view a complete list of the filenames on a disk (i.e., read the disk directory), type:

```
LOAD "$",8 <press return>
LIST
```

In 128 mode on a C-128, you can just press F3.

12. When you know what program you want to load, next make sure you know *exactly* how its filename is spelled in the disk directory, including punctuation, special characters and spaces. A mistake in the filename will keep the load from working.

If the disk directory is still on the screen when you enter the Load command, you can refer to that for the spelling. If the directory will be gone from the screen by the time you enter the Load command, jot down the exact spelling of the filename for reference. Once you're sure of the filename, load the program by typing:

```
LOAD "NAME",8 <press return>
```

In 128 mode on a C-128, you can just press F2, type in the filename and press the return key.

13. After you've loaded the program, enter RUN to use it. ■

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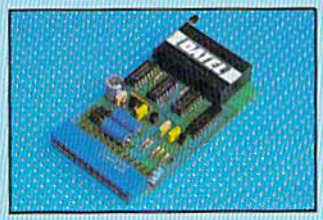

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Drip-Drop

It's raining, it's pouring—let's see how you're scoring.

By JOHN FEDOR

Whatever scenario, whether farfetched or realistic, you may supply to go with it, Drip-Drop is a fun game your whole family will enjoy. The action is uncomplicated, but the 25 difficulty levels offer plenty of arcade-type challenge.

Playing Catch

Type in Listing 1, then save it to disk. When you run it, the game screen immediately appears, with a status line and instructions at the top. Move the joystick in port 2 up and down to choose your starting difficulty level (1–25); then press the joystick button to start play at the level currently displayed.

The instructions disappear, and a dark cloud starts floating across the sky, just below the status line. Soon rain begins to fall from the cloud onto flames licking along the bottom of the screen. Three buckets are poised, one above the other, between the sky and the flames, waiting to go into action.

Use the joystick to move the buckets left and right and catch the falling drops. Each time you catch one, you're awarded five points. If you miss a drop, it hits the fire, the top bucket disappears and play continues with only two.

When you've missed three drops and lost all three buckets, the game is over, but you can start over by pressing the joystick button again. If you catch all the drops at one difficulty level, a short tune plays and you're sent to the next level.

The number of drops that fall at each level is equal to ten times the number of the level, for a maximum of 250. The higher the level the faster the drops fall and the greater the distance between them. In the more advanced stages of the game, you'll wish you were toting around a swimming pool.

If you need a break during play, press the shift-lock key. The action will stop, and a blue border will appear around the screen. When you're ready, press shift-lock once more to continue. The best time to pause is between levels, just before it starts raining again.

I designed Drip-Drop to have as short a listing as possible while still providing interesting graphics, sound and action. The graphics consist of redefined graphics characters—six in the cloud, one in the raindrop, three in the bucket and four in the flames. The flame characters are continually redefined to simulate motion.

Oh-oh! I think I hear thunder. Better grab your buckets and get ready! Ⓡ

John Fedor, who especially enjoys math and working with his computer, is a student at the College of Lake County, in Illinois, where it rains fairly often.

Listing 1. Drip-Drop program.

```
Ø REM DRIP-DROP BY JOHN FEDOR
                          :REM*129
1Ø PRINT"{SHFT CLR}PLEASE WAIT.
   ..READING DATA."       :REM*82
2Ø FORI=49152TO5Ø851:READA:POKE
   I,A:NEXT               :REM*174
3Ø SYS 49152              :REM*2Ø4
4Ø DATA 169,Ø,141,75,3,141,76,3
   ,141,77,3,76,23,197,173,14,2
   2Ø,41,254,141,14       :REM*218
5Ø DATA 22Ø,165,1,41,251,133,1,
   162,Ø,189,Ø,2Ø8,157,Ø,48,189
   ,Ø,2Ø9,157,Ø,49        :REM*153
6Ø DATA 189,Ø,21Ø,157,Ø,5Ø,189,
   Ø,211,157,Ø,51,232,2Ø8,229,1
   65,1,9,4,133,1         :REM*142
7Ø DATA 173,14,22Ø,9,1,141,14,2
   2Ø,173,24,2Ø8,41,24Ø,9,12,14
   1,24,2Ø8,162,Ø         :REM*9
8Ø DATA 189,163,197,157,8,51,23
   2,224,112,2Ø8,245,96,169,8,1
   62,Ø,157,152,219       :REM*53
9Ø DATA 232,224,8Ø,2Ø8,248,169,
   1,141,6Ø,3,2Ø6,6Ø,3,173,6Ø,3
   ,2Ø8,29,169,64         :REM*1Ø2
1ØØ DATA 141,6Ø,3,162,Ø,173,4,2
   2Ø,41,1,24,1Ø5,1Ø7,157,152,
   7,24,1Ø5,2,157         :REM*198
11Ø DATA 192,7,232,224,4Ø,2Ø8,2
   34,96,2Ø6,63,3,173,63,3,24Ø
   ,1,96,169,128          :REM*184
12Ø DATA 141,63,3,173,Ø,22Ø,41,
   12,133,252,2Ø1,12,2Ø8,1,96,
   169,3,133,2,174        :REM*252
13Ø DATA 61,3,172,62,3,169,32,1
   92,3,2Ø8,3,157,88,6,192,2,1
   44,3,157,2Ø8,6         :REM*132
14Ø DATA 157,72,7,232,198,2,165
   ,2,2Ø8,23Ø,165,252,41,4,2Ø8
   ,15,2Ø6,61,3,173       :REM*249
15Ø DATA 61,3,2Ø1,255,2Ø8,5,169
   ,Ø,141,61,3,165,252,41,8,2Ø
   8,15,238,61,3          :REM*21Ø
16Ø DATA 173,61,3,2Ø1,38,144,5,
   169,37,141,61,3,169,Ø,133,2
   ,174,61,3,164,2        :REM*37
17Ø DATA 185,19,198,133,251,172
   ,62,3,192,3,2Ø8,16,189,88,6
   ,72,165,251,157        :REM*182
18Ø DATA 88,6,169,9,157,88,218,
   165,251,192,2,144,16,189,2Ø
   8,6,72,165,251         :REM*14
19Ø DATA 169,9,157,2Ø8,218,165,
   251,157,2Ø8,6,189,72,7,72,1
   65,251,157,72,7        :REM*253
2ØØ DATA 169,9,157,72,219,232,2
   3Ø,2,165,2,2Ø1,3,2Ø8,183,16
   Ø,Ø,162,Ø,1Ø4          :REM*166
21Ø DATA 2Ø1,1Ø6,2Ø8,3,238,68,3
   ,232,224,3,2Ø8,243,162,Ø,2Ø
   Ø,2Ø4,62,3,2Ø8         :REM*99
22Ø DATA 235,173,68,3,24Ø,9,162
   ,128,142,11,212,232,142,11, ►
```

RUN it right: **C-64**

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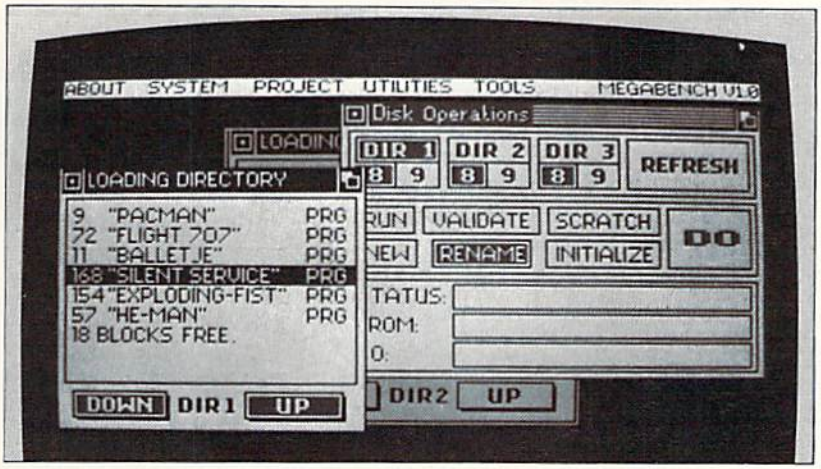

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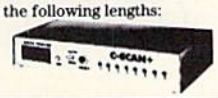

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```
    212,96,206,66,3     :REM*214
230 DATA 173,66,3,240,1,96,169,
    192,141,66,3,173,65,3,205,6
    4,3,208,3,32,213    :REM*32
240 DATA 193,169,32,174,64,3,16
    0,0,157,80,4,157,120,4,232,
    200,192,3,208       :REM*73
250 DATA 244,173,64,3,205,65,3,
    144,6,206,64,3,206,64,3,238
    ,64,3,174,64,3      :REM*156
260 DATA 160,0,169,11,157,80,21
    6,157,120,216,185,22,198,15
    7,80,4,185,25       :REM*77
270 DATA 198,157,120,4,232,200,
    192,3,208,230,76,20,194,32,
    151,224,165,140     :REM*46
280 DATA 41,63,201,38,176,245,2
    05,64,3,240,240,141,65,3,96
    ,24,162,0,160,8     :REM*122
290 DATA 32,240,255,162,0,189,2
    8,198,32,210,255,232,224,25
    ,208,245,24,162     :REM*213
300 DATA 1,160,8,32,240,255,162
    ,0,189,53,198,32,210,255,23
    2,224,24,208,245    :REM*162
310 DATA 96,206,72,3,173,72,3,2
    40,1,96,173,74,3,141,72,3,1
    69,7,133,252,169    :REM*32
320 DATA 219,133,254,169,112,13
    3,251,133,253,160,0,132,2,1
    77,251,201,106      :REM*18
330 DATA 208,73,24,165,2,105,40
    ,168,177,251,201,103,144,25
    ,201,106,176,21     :REM*146
340 DATA 162,128,142,11,212,232
    ,142,11,212,238,68,3,164,2,
    169,32,145,251      :REM*35
350 DATA 76,132,194,201,107,240
    ,4,201,108,208,14,162,128,1
    42,18,212,232       :REM*2
360 DATA 142,18,212,169,1,141,7
    3,3,169,6,145,253,169,106,1
    45,251,164,2,169    :REM*195
370 DATA 32,145,251,200,192,40,
    208,170,56,165,251,233,40,1
    33,251,133,253      :REM*133
380 DATA 165,252,233,0,133,252,
    24,165,252,105,212,133,254,
    165,251,201,120     :REM*197
390 DATA 208,140,165,252,201,4,
    208,134,206,71,3,173,71,3,2
    40,1,96,173,79,3    :REM*118
400 DATA 141,71,3,173,69,3,208,
    1,96,206,69,3,174,64,3,232,
    169,6,157,160       :REM*84
410 DATA 216,169,106,157,160,4,
    162,32,142,4,212,232,142,4,
    212,96,162,3,160    :REM*98
420 DATA 0,189,74,3,74,74,74,74
    ,24,105,48,153,55,4,200,189
    ,74,3,41,15,24      :REM*83
430 DATA 105,48,153,55,4,200,20
    2,208,227,173,78,3,74,74,74
    ,74,24,105,48       :REM*191
440 DATA 141,70,4,173,78,3,41,1
    5,24,105,48,141,71,4,96,24,
    173,68,3,109,67     :REM*70
450 DATA 3,141,67,3,173,68,3,24
    0,35,206,68,3,120,248,24,17
    3,75,3,105,5,141    :REM*7
460 DATA 75,3,173,76,3,105,0,14
    1,76,3,173,77,3,105,0,141,7
    7,3,216,88,76,31    :REM*7
470 DATA 195,173,67,3,205,70,3,
    208,5,169,2,141,73,3,76,219
    ,194,162,0,134      :REM*134
480 DATA 252,142,67,3,142,68,3,
    162,64,142,72,3,173,78,3,74
    ,74,74,74,133       :REM*30
490 DATA 251,162,0,24,165,251,1
    01,252,133,252,232,224,10,2
    08,244,173,78,3     :REM*24
500 DATA 41,15,24,101,252,133,2
    52,133,253,169,0,133,251,16
    2,0,24,165,252      :REM*97
510 DATA 101,251,133,251,232,22
    4,10,208,244,165,251,141,69
    ,3,141,70,3,173     :REM*147
520 DATA 78,3,201,38,144,8,169,
    240,141,69,3,141,70,3,165,2
    53,74,201,10,144    :REM*158
530 DATA 2,169,10,133,2,56,169,
    10,229,2,170,224,3,176,2,16
    2,3,142,79,3,165    :REM*168
540 DATA 253,162,2,201,10,144,8
    ,202,201,20,144,3,206,79,3,
    142,74,3,96,173     :REM*116
550 DATA 141,2,41,1,240,17,169,
    6,141,32,208,173,141,2,41,1
    ,208,249,169,3      :REM*8
560 DATA 141,32,208,96,162,0,13
    8,157,0,212,232,224,24,208,
    248,169,15,141      :REM*2
570 DATA 24,212,169,50,141,5,21
    2,162,40,142,12,212,232,142
    ,19,212,169,40      :REM*222
580 DATA 141,1,212,141,8,212,16
    9,155,141,15,212,96,162,0,1
    38,157,0,212,232    :REM*156
590 DATA 224,24,208,248,169,15,
    141,24,212,169,240,141,6,21
    2,162,0,134,2       :REM*185
600 DATA 189,77,198,141,1,212,1
    89,82,198,141,0,212,169,33,
    141,4,212,162,0     :REM*213
610 DATA 160,0,136,208,253,202,
    208,250,169,32,141,4,212,16
    2,16,160,0,136      :REM*141
620 DATA 208,253,202,208,250,16
    6,2,232,224,5,208,205,96,17
    3,73,3,240,1,96     :REM*231
630 DATA 24,162,5,160,1,32,240,
    255,162,0,189,87,198,32,210
    ,255,232,224,39     :REM*83
640 DATA 208,245,24,162,6,160,2
    ,32,240,255,162,0,189,126,1
    98,32,210,255       :REM*52
650 DATA 232,224,36,208,245,173
    ,0,220,41,16,240,249,169,1,
    141,78,3,32,151     :REM*76
660 DATA 224,32,219,194,173,0,2
    20,73,31,41,31,133,2,41,1,2
    40,22,120,248,24    :REM*101
670 DATA 173,78,3,105,1,141,78,
    3,216,88,201,38,208,5,169,3
    7,141,78,3,165,2    :REM*114
680 DATA 41,2,240,20,120,248,56
    ,173,78,3,233,1,141,78,3,21
    6,88,208,5,169,1    :REM*11
690 DATA 141,78,3,162,64,160,0,
    136,208,253,202,208,250,165
    ,2,201,16,208       :REM*112
700 DATA 173,162,0,169,32,157,2
    00,4,232,224,80,208,248,169
    ,0,141,75,3,141     :REM*201
710 DATA 76,3,141,77,3,96,169,3
    ,141,62,3,141,66,3,169,20,1
    41,61,3,141,64,3    :REM*247
720 DATA 141,65,3,169,8,32,210,
    255,169,3,141,32,208,141,33
    ,208,169,1,141      :REM*15
730 DATA 71,3,32,14,192,32,87,1
    95,32,249,195,169,147,32,21
    0,255,32,233,193    :REM*149
740 DATA 32,95,192,32,254,192,3
    2,112,196,32,87,195,169,0,1
    41,73,3,32,112      :REM*17
750 DATA 192,32,150,192,32,118,
    193,32,21,195,32,224,195,17
    3,73,3,240,236      :REM*92
760 DATA 162,0,160,0,136,208,25
    3,202,208,250,201,1,208,16,
    206,62,3,173,62     :REM*12
770 DATA 3,208,175,169,0,141,73
    ,3,76,23,197,32,37,196,120,
    248,24,173,78,3     :REM*123
780 DATA 105,1,141,78,3,216,88,
    76,55,197,0,0,0,30,31,63,63
    ,63,0,15,15,127     :REM*40
790 DATA 255,255,255,255,0,128,
    128,240,240,248,248,248,127
    ,127,127,14,0,0     :REM*42
800 DATA 0,0,255,255,191,15,7,0
    ,0,0,248,248,224,192,128,0,
    0,0,0,0,0,192       :REM*55
810 DATA 192,243,255,255,0,0,0,
    0,0,51,255,255,0,0,0,3,3,51
    ,255,255,0,16,8     :REM*214
820 DATA 8,28,62,62,28,0,0,16,8
    1,81,133,115,243,0,0,8,138,
    138,142,206,207     :REM*1
830 DATA 247,247,255,255,255,25
    5,255,255,239,239,255,255,2
    55,255,255,255      :REM*244
840 DATA 103,104,105,97,98,99,1
    00,101,102,5,68,82,73,80,45
    ,68,82,79,80,32     :REM*174
850 DATA 32,66,89,32,74,79,72,7
    8,32,70,69,68,79,82,83,67,7
    9,82,69,58,32,48    :REM*237
860 DATA 48,48,48,48,48,32,32,7
    6,69,86,69,76,58,32,48,48,2
    9,22,29,22,29,49    :REM*193
870 DATA 96,49,96,49,154,77,79,
    86,69,32,74,79,89,83,84,73,
    67,75,32,85,80      :REM*75
880 DATA 47,68,79,87,78,32,84,7
    9,32,65,68,74,85,83,84,32,7
    6,69,86,69,76,46    :REM*134
890 DATA 80,82,69,83,83,32,70,7
    3,82,69,66,85,84,84,79,78,3
    2,84,79,32,66,69    :REM*140
900 DATA 71,73,78,32,68,82,73,8
    0,45,68,82,79,80,46,255,255
    ,255,255,255,255    :REM*230
```

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Moving Messages

Tell it to the world—by scrolling text of any size continuously across the screen.

By MIKE RICHARDSON

Have you ever wished you could scroll large messages across your C-64's monitor screen—perhaps at a user's group meeting or in a class at school? Well, you can do it now with my Computer Board 64 program.

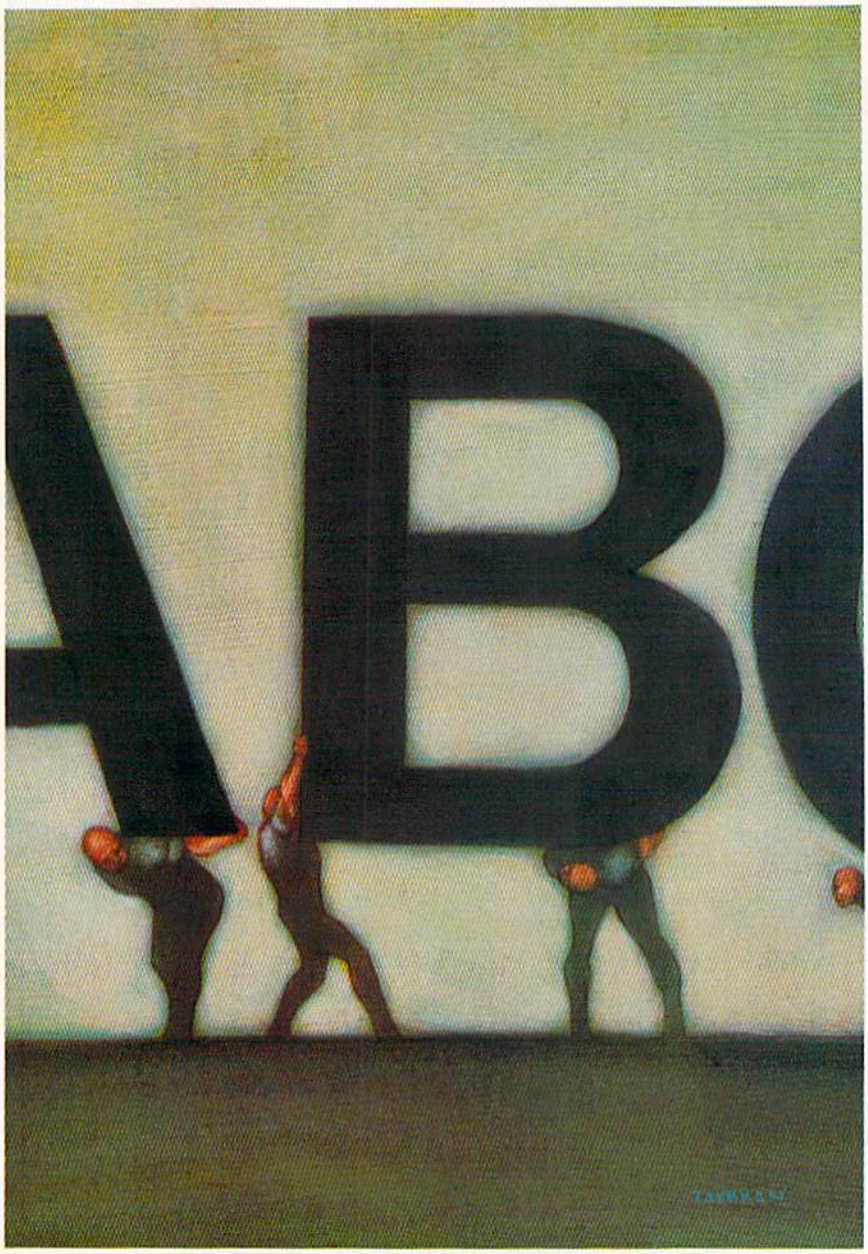
Using *RUN*'s Checksum program, type in, and then save, Listing 1, which is a Basic loader for the main machine language program that's stored in memory locations $C000–$C4FF (49152–50431). The text you want to scroll is stored in $C500–$CFFF (50432–53247).

The machine language program can be activated by either of two SYS commands. SYS 49276 is the normal choice, because it uses Commodore's standard character set, but you can also load a custom character set into location 8192, then enter SYS 49284.

Now type in Listing 2, using *RUN*'s Checksum program once again. You'll find that Listing 2 makes easy work of entering your message text into memory. All you have to do is set A$ to a line of text and enter GOSUB 60000. If you need assistance, refer to the REM statements.

Listing 2 also contains information on variables used within Listing 1 that can be changed. Listing 2 explains what to do—just follow the prompts.

You'll quickly discover that you can change the size of your characters, delay the scrolling and otherwise manipulate your message by using the function keys. The actions they perform are listed in Table 1.



RUN it right: **C-64**

ILLUSTRATED BY TIM TEEBKEN

How It Works

If you enter SYS 49276, the machine language program begins by copying the standard Commodore character set, then setting the screen colors. To set the colors without copying the character set, use SYS 49284. You can change ►

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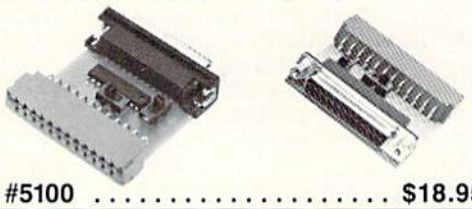

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the starting values for the screen colors with the following Pokes:

Border/background—POKE 49296,color
Characters—POKE 49247,color

With these preliminaries out of the way, the program clears the screen and begins to process your text, starting with the first character. Characters on the C-64 consist of 8-pixel × 8-pixel matrices, so the program encodes each character as 64 ones and zeros (see Figure 1). It stores the code, then proceeds by columns and rows. If column 1, row 1 is zero, a space is printed to the screen; if it's a one, a character is printed. If the height is two, the last step is repeated once; if it's three, the last step is repeated twice. The program processes each row in turn, until row 8 is completed.

Next, the screen scrolls and the last column is reopened. If the width is greater than one, the previous column is repeated until the correct width is reached. The columns are processed in order until the character is finished, then on to succeeding characters until your entire message is "on the move." Ⓡ

Mike Richardson, a tenth-grade student in Adrian, Michigan, has been programming—of late mainly in machine language—for about five years. He started with Basic and now wants to learn Comol.

Table 1. Function Key actions.

F1	Change height
F2	Delay scroll
F3	Change width
F4	Change character
F5	Clear screen
F6	Repeat entire message
F7	Erase screen by scroll
F8	Exit to Basic

Figure 1. Sample character coding.

AA		00011000
AAAA		00111100
AA AA		01100110
AAAAAA	becomes	01111110
AA AA		01100110
AA AA		01100110
AA AA		01100110
		00000000

Listing 1. Basic Loader program.

```
Ø REM COMPUTER BOARD (SCROLLER)
   - RICHARDSON          :REM*13
1Ø PRINT"{SHFT CLR}POKING DATA.
   .."                   :REM*1
2Ø FORA=1TO833:READB:CK=CK+B:PO
   KE49151+A,B:NEXT      :REM*39
3Ø IFCK<>1Ø1952THENPRINT"ERROR
   IN DATA STATEMENTS.":STOP
                         :REM*195
4Ø PRINT"{CRSR DN}COMPUTER BOAR
   D 64 ACTIVATED."      :REM*18Ø
5Ø PRINT"{CRSR DN}SYS #1-49276"
   :PRINT"SYS #2-49284":REM*23Ø
6Ø PRINT"{CRSR DN}USE PROGRAM #
   2 TO ENTER DATA."     :REM*166
7Ø END                   :REM*198
1ØØ DATA 173,14,22Ø,41,254,141,
    14,22Ø,165,1,41,251,133,1,1
    69,Ø,133,251,133     :REM*161
11Ø DATA 253,169,32,133,252,169
    ,2Ø8,133,254,16Ø,Ø,177,253,
    145,251,2ØØ,2Ø8      :REM*238
12Ø DATA 249,24,165,252,1Ø5,1,1
    33,252,24,165,254,1Ø5,1,133
    ,254,165,252,2Ø1     :REM*222
13Ø DATA 48,2Ø8,227,165,1,9,4,1
    33,1,173,14,22Ø,9,1,141,14,
    22Ø,96,16Ø,28        :REM*77
14Ø DATA 185,43,Ø,153,65,195,13
    6,2Ø8,247,96,162,Ø,16Ø,216,
    134,251,132,252      :REM*114
15Ø DATA 16Ø,Ø,169,2,145,251,24
    ,165,251,1Ø5,1,133,251,165,
    252,1Ø5,Ø,133        :REM*38
16Ø DATA 252,165,251,2Ø1,255,2Ø
    8,233,165,252,2Ø1,219,2Ø8,2
    27,96,169,147,32     :REM*1Ø8
17Ø DATA 21Ø,255,32,Ø,192,169,1
    47,32,21Ø,255,32,84,192,32,
    72,192,169,Ø,141     :REM*39
18Ø DATA 32,2Ø8,141,33,2Ø8,173,
    24,2Ø8,41,24Ø,9,8,141,24,2Ø
    8,162,Ø,134,53       :REM*7
19Ø DATA 162,2,134,51,134,52,16
    2,81,134,49,162,Ø,134,47,16
    2,197,134,48,162     :REM*216
2ØØ DATA Ø,16Ø,32,134,55,132,56
    ,32,225,255,2Ø8,3,76,2Ø4,19
    4,16Ø,Ø,177,47       :REM*2Ø5
21Ø DATA 2Ø1,133,144,4,2Ø1,141,
    144,98,133,5Ø,16Ø,Ø,177,47,
    17Ø,24Ø,17,24        :REM*199
22Ø DATA 165,55,1Ø5,8,133,55,16
    5,56,1Ø5,Ø,133,56,2Ø2,76,21
    8,192,16Ø,Ø,132      :REM*93
23Ø DATA 7Ø,162,196,142,9,193,1
    62,Ø,142,8,193,162,Ø,177,55
    ,221,248,194,176     :REM*168
24Ø DATA 4Ø,72,169,32,157,64,19
    6,1Ø4,232,224,8,144,239,2ØØ
    ,173,8,193,1Ø5,7     :REM*49
25Ø DATA 141,8,193,173,9,193,1Ø
    5,Ø,141,9,193,23Ø,7Ø,165,7Ø
    ,2Ø1,8,144,21Ø       :REM*57
26Ø DATA 76,56,193,56,253,248,1
    94,72,165,49,2Ø8,21Ø,76,6,1
    94,162,39,16Ø,4      :REM*141
27Ø DATA 134,67,132,68,166,51,2
    Ø2,24Ø,16,224,1,2Ø8,6,162,1
    99,134,67,2Ø8,6      :REM*5
28Ø DATA 162,1Ø3,134,67,23Ø,68,
    166,67,134,57,166,68,134,58
    ,162,Ø,16Ø,196       :REM*235
29Ø DATA 134,59,132,6Ø,16Ø,Ø,13
    2,61,134,62,162,Ø,16Ø,Ø,177
    ,59,145,57,164       :REM*7Ø
3ØØ DATA 51,192,1,24Ø,42,192,2,
    24Ø,57,32,149,193,24,165,59
    ,1Ø5,8,133,59        :REM*1Ø9
31Ø DATA 165,6Ø,1Ø5,Ø,133,6Ø,23
    2,224,8,144,219,76,188,193,
    24,165,57,1Ø5,4Ø     :REM*118
32Ø DATA 133,57,165,58,1Ø5,Ø,13
    3,58,96,32,172,193,32,172,1
    93,76,125,193,72     :REM*1ØØ
33Ø DATA 32,149,193,1Ø4,16Ø,Ø,1
    45,57,96,32,172,193,76,125,
    193,32,Ø,195,166     :REM*75
34Ø DATA 52,224,4,24Ø,17,224,3,
    24Ø,1Ø,224,2,24Ø,3,32,Ø,195
    ,32,Ø,195,32,Ø       :REM*49
35Ø DATA 195,169,Ø,133,59,165,6
    7,133,57,165,68,133,58,23Ø,
    61,165,61,24,1Ø1     :REM*218
36Ø DATA 59,133,59,23Ø,62,165,6
    2,2Ø1,8,176,3,76,1Ø7,193,24
    ,165,47,1Ø5,1        :REM*37
37Ø DATA 133,47,165,48,1Ø5,Ø,13
    3,48,76,183,192,2Ø1,133,2Ø8
    ,31,32,234,194       :REM*69
38Ø DATA 16Ø,Ø,177,47,2Ø1,1,144
    ,12,2Ø1,4,176,14,133,51,32,
    234,194,76,191       :REM*Ø
39Ø DATA 192,169,1,2Ø8,244,169,
    3,2Ø8,24Ø,2Ø1,134,2Ø8,31,32
    ,234,194,16Ø,Ø       :REM*126
4ØØ DATA 177,47,2Ø1,1,144,12,2Ø
    1,5,176,12,133,52,32,234,19
    4,76,191,192,169     :REM*111
41Ø DATA 1,2Ø8,244,169,4,2Ø8,24
    Ø,2Ø1,135,2Ø8,14,169,147,32
    ,21Ø,255,32,84       :REM*144
42Ø DATA 192,32,234,194,76,192,
    192,2Ø1,136,2Ø8,5Ø,162,39,1
    6Ø,4,134,251,132     :REM*163
43Ø DATA 252,162,Ø,16Ø,Ø,169,32
    ,145,251,24,165,251,1Ø5,4Ø,
    133,251,165,252      :REM*76
44Ø DATA 1Ø5,Ø,133,252,232,224,
    25,144,234,162,4Ø,134,2,32,►
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- Super C 128 or 64 (Abacus) 45
- Super Pascal 128 or 64 (Abac) 45
- Super Snapshot V.3(K Jax) 49
- Super 81 Utilities (Free Sp) 29
- SUPERCAT (K Jax) 22
- SYSRES Enhanced (Comp Mart) $32
- Super Aide 64 (Free Spirit) 24
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- Hacker's Utility Kit (K Jax) 17
- ELITE 3 (K Jax) 10
- ELITE 4 (K Jax) 15

HOME/BUSINESS

- Accountant 128 (KFS) 119
  - Add-on modules 55
- BEST A/P or A/R or G/L 45
- BEST Project Planner or Inventory 45
- Business Form Shop (Spinn) 30
- Business Management 64 - Timeworks Inventory, A/P, A/R, Sales Analysis, General Ledger OR Payroll 39
- CMS Accounting 128 129
- CMS Inventory 128 53
- Chartpak 128 or 64 (Abacus) 29
- Data Manager 128 (Timeworks) 39
- Fleet System 2 + (Professional) 39
- Fleet System 4 (Professional) 49
- Fontmaster 128 (Xetec) 39
- Fontmaster II 64 (Xetec) 35
- GEOS 128 (Berkeley) 45
  - Geowrite Workshop 128 45
  - Geocalc or Geofile 128 45
- GEOS 64 (Berkeley) 39
  - Geocalc or Geofile 35
  - Geowrite Workshop 33
  - Geospell 26
  - Geoprogrammer 45
  - Triple Pak 39
- GEO Publish 64(Berkely) 45
- GEOPUBLISH 128 (Berkely) call
- Microlawyer (Progressive) 45
- Neofont (CDA) 24
- Outrageous Pages (Elec Arts) 39
- Page Builder 128 (Patech) 39
- Partner 64 (Timeworks) 30
- Partner 128 (Timeworks) 39
- Personal Newsletter 64 (Soft Syn) 39
- Pocket Superpak 2 64/128 69
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- TAS 128 (Abacus) 42
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- The Write Stuff 64 (Busy Bee) 19
- The Write Stuff 64 with Talker 24

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- Celebrity Cookbook (Merrill) 25
- Crossword (Radarsoft) 12
- Dream Analayzer (Merrill) 25
- Enhanced Stress (Bodylog) 229
- Family Tree 128 or 64 (Geneal) 39
- Heartlab (Bodylog) 49
- Muscle Development (Bodylog) 54
- Sexual Edge (Merrill) 20
- Standard Stress (Bodylog) 89

EDUCATIONAL

- Evelyn Wood Dynamic Reader 19
- Fisher Price
  - Peter Rabbit Reading (3-6) 19
  - Jungle Book Reading (6-9) 19
  - First Men on Moon Math (9 +) 19
- Hayden Score Imp For SAT 35
- Pro Tutor - Accounting 69
- RSVP (Blue Lion) 21
- Spinnaker
  - Facemaker (3-8) 18
  - Alphabet Zoo (3-7) 18
  - Kids on Keys (4-9) 18
  - Kindercomp (3 - 8) 18
  - Math Busters (8-14) 22
  - Kidwriter (6-10) 22
  - Homework Helper Math (10 +) 29
  - Homework Helper Write (10 +) 29
  - Early Learning Friends (3-8) 6
  - Grandma's House 6
- Ticket to London or Paris or Spain (Blue Lion) 21
- Weekly Reader - Sticky Bear Math 1, Math 2, Numbers, ABC, Shapes, Opposites, Reading, Townbuilder or Typing EACH 22
- Widham Classics
  - Alice in Wonderland, Wizard of Oz, Treasure Island, Below the Root or Swiss Family Robinson (each) 12
- Maps USA, World/Europe (Ea.) 19

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- Mousepad 9
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- RS-232 INTERFACE 39
- Super Graphix Gold (Xetec) 89
- 40/80 Column Switch Cable 18
- Right Time-Bat. Clock/Calendar 49

BOOKS

- C128 Programmer Reference (B) 22
- GEOS Programmer Reference (B) 19
- How to Get Most Out of Geos 13
- K Jax Revealed II (Comp. Mart) 23
- Superbase The Book (Prog.) 15
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```
    Ø,195,2Ø2,2Ø8          :REM*159
45Ø DATA 248,32,234,194,76,199,
    192,2Ø1,137,2Ø8,18,162,255,
    16Ø,255,136,2ØØ        :REM*43
46Ø DATA 136,2Ø8,251,2Ø2,2Ø8,24
    6,32,234,194,76,191,192,2Ø1
    ,138,2Ø8,15,32         :REM*45
47Ø DATA 234,194,16Ø,Ø,177,47,1
    33,49,32,234,194,76,191,192
    ,2Ø1,139,2Ø8,11        :REM*95
48Ø DATA 162,Ø,16Ø,197,134,47,1
    32,48,76,191,192,16Ø,28,185
    ,65,195,153,43,Ø       :REM*2Ø5
49Ø DATA 136,2Ø8,247,169,6,141,
    33,2Ø8,169,14,141,32,2Ø8,14
    1,134,2,169,147        :REM*213
5ØØ DATA 32,21Ø,255,96,24,165,4
    7,1Ø5,1,133,47,165,48,1Ø5,Ø
    ,133,48,96,128         :REM*216
51Ø DATA 64,32,16,8,4,2,1,162,Ø
    ,16Ø,4,134,63,132,64,232,13
    4,65,132,66,16Ø        :REM*85
52Ø DATA Ø,177,65,145,63,2ØØ,19
    2,39,144,247,24,165,63,1Ø5,
    4Ø,133,63,165,64       :REM*125
53Ø DATA 1Ø5,Ø,133,64,24,165,65
    ,1Ø5,4Ø,133,65,165,66,1Ø5,Ø
    ,133,66,166,66         :REM*1Ø1
54Ø DATA 224,7,2Ø8,213,166,65,2
    24,233,2Ø8,2Ø7,166,2,96
                           :REM*171
```

Listing 2. Text input program.

```
Ø REM COMPUTER BOARD LISTING #2
                           :REM*1Ø
1 REM POKE 49247,FOREGROUND COL
  OR - OPTIONAL (DEFAULT - RED)
                           :REM*22Ø
2 REM POKE 49296,BACKGROUND & B
  ORDER COLORS - OPTIONAL (DEFA
  ULT - BLACK)             :REM*141
1Ø SA=5Ø432:C=-1:REM PROGRAM VA
   RIABLES.{2 SPACEs}DON'T CHAN
   GE                      :REM*26
2Ø REM F1-HEIGHT............."{
   FUNCT 1}"               :REM*144
3Ø REM F2-DELAY............."{
   FUNCT 2}"               :REM*115
4Ø REM F3-WIDTH............."{
   FUNCT 3}"               :REM*115
5Ø REM F4-CHANGE CHARACTER..."{
   FUNCT 4}"               :REM*1Ø3
6Ø REM F5-CLEAR SCREEN......."{
   FUNCT 5}"                :REM*1
7Ø REM F6-REPEAT............."{
   FUNCT 6}"               :REM*142
8Ø REM F7-ERASE BY SCROLLING."{
   FUNCT 7}"               :REM*86
9Ø REM F8-EXIT TO BASIC....."{
   FUNCT 8}"               :REM*192
1ØØ REM NO REVERSED CHARACTERS
    EXCEPT WHEN USING F4, MAX H
    EIGHT=3, MAX WIDTH=4
                           :REM*199
11Ø REM PRESS STOP KEY TO EXIT
    TO BASIC               :REM*1Ø4
12Ø REM SYS 49276-COPY CHARACTE
    R SET FROM ROM TO RAM BEFOR
    E STARTING             :REM*47
13Ø REM SYS 49284-DOESN'T COPY
    CHARACTER SET, ALLOWS FOR C
    USTOM FONTS (AT 8192):REM*4
14Ø REM FOR HEIGHT, 1=BIG, 2=ME
    DIUM, 3=SMALL          :REM*191
15Ø REM FOR WIDTH, 1=EXTRA BIG,
     2=BIG, 3=MEDIUM, 4=SMALL
                           :REM*127
16Ø A$="{FUNCT 4}{SHFT Q}{FUNCT
     1}3{FUNCT 3}3INTRODUCING:{
    FUNCT 1}1{FUNCT 3}1{FUNCT 4
    }{CTRL 9} {CTRL Ø}COMPUTER
    BOARD 64!{FUNCT 7}":REM*121
17Ø GOSUB6ØØØØ             :REM*6
18Ø A$="{FUNCT 1}3{FUNCT 3}4{FU
    NCT 4}{SHFT Q}F1-HEIGHT F2-
    DELAY F3-WIDTH F4-CHANGE CH
    AR. F5-CLEAR F6-REPEAT"
                           :REM*137
19Ø GOSUB6ØØØØ             :REM*18
2ØØ A$=" ENTIRE MESSAGE F7-ERAS
    E SCREEN F8-EXIT TO"
                           :REM*189
21Ø GOSUB6ØØØØ             :REM*46
22Ø A$=" BASIC.{FUNCT 2}{FUNCT
    5}{FUNCT 1}1{FUNCT 3}4 LOAD
     NEW FONT INTO 8192 ($2ØØØ)
     & USE SYS NUMBER 2."
                           :REM*24
23Ø GOSUB6ØØØØ             :REM*58
24Ø A$="{FUNCT 2}{FUNCT 5}{FUNC
    T 1}3{FUNCT 3}1 SYS #1=4927
    6 (COPY CHAR. SET){2 SPACEs
    }SYS #2=49284.{FUNCT 7}{FUN
    CT 6}"                 :REM*66
25Ø GOSUB6ØØØØ             :REM*86
26Ø SYS49276               :REM*2Ø9
27Ø REM CONTINUE PROGRAM FROM 2
    7Ø-59999               :REM*84
6ØØØØ FORA=1TOLEN(A$):B=ASC(MID
      $(A$,A,1)):C=C+1     :REM*119
6ØØ1Ø IFB=146THENRV=Ø:C=C-1:GOT
      O6Ø11Ø               :REM*74
6ØØ2Ø IFB=18THENRV=1:C=C-1:GOTO
      6Ø11Ø                :REM*236
6ØØ3Ø IFB=133ORB=134THEND=1:GOT
      O6Ø1ØØ               :REM*15Ø
6ØØ4Ø IFB>=133ANDB<=14ØTHEN6Ø1Ø
      Ø                    :REM*58
6ØØ5Ø IFD=1THENB=B-48:D=Ø:GOTO6
      Ø1ØØ                 :REM*87
6ØØ6Ø IFB=255THENB=94:GOTO6Ø1ØØ
                           :REM*33
6ØØ7Ø IFB>192ANDRV=ØTHENB=B-128
      :GOTO6Ø1ØØ           :REM*39
6ØØ8Ø IFB>=64THENB=B-64:REM*21Ø
6ØØ9Ø IFRV=1THEN6Ø12Ø      :REM*18Ø
6Ø1ØØ POKESA+C,B           :REM*98
6Ø11Ø NEXT:RETURN          :REM*131
6Ø12Ø IFB<>255THENB=B+128:GOTO6
      Ø14Ø                 :REM*191
6Ø13Ø B=222                :REM*14
6Ø14Ø IFB>255THENEND       :REM*87
6Ø15Ø GOTO6Ø1ØØ          :REM*16Ø■
```

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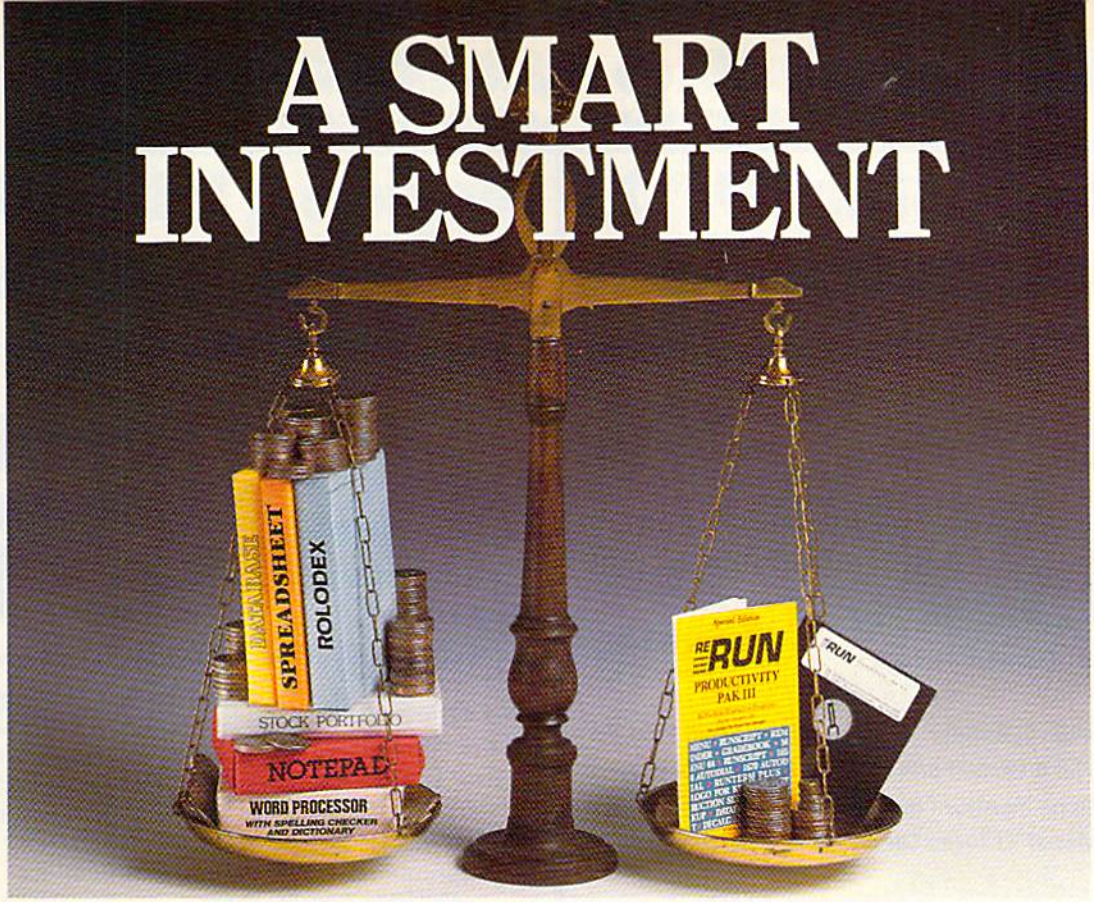

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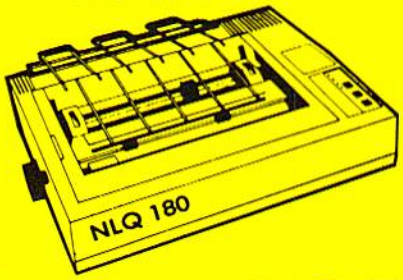

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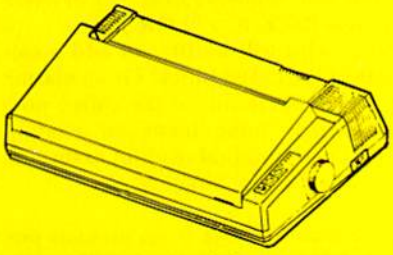

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By JESSE SHERWOOD

C-128 Clock advances mankind's timekeeping ability by visually constructing two clocks on the C-128's 40-column screen.

One is a 12-hour analog clock with hour and minute hands and an AM/PM indicator. It's enclosed in a handsome "ebony" case, but if you'd prefer "mahogany," all you have to do is change line 310 to COLOR 1,10. This clock also strikes the hours and plays the authentic Westminster Chimes tune on the quarter hours.

Fitted into the base of the mantel clock is a 24-hour digital clock that displays hours, minutes and seconds.

Type in Listing 1, using *RUN*'s Checksum program, save it to disk and then run it in 80-Column mode. Set the time and start the clocks as prompted. When you switch your monitor to 40 columns, lo and behold, the clocks appear!

If you have 40-Column mode only, wait about 20 seconds until the program creates the initial drawing (nothing will be visible), then type in the current time using a 24-hour hhmmss format. For example, 2:30 PM would be entered as 143000. There still won't be any display, so you'll have to do this "in the blind." Finally, press return to see the clocks.

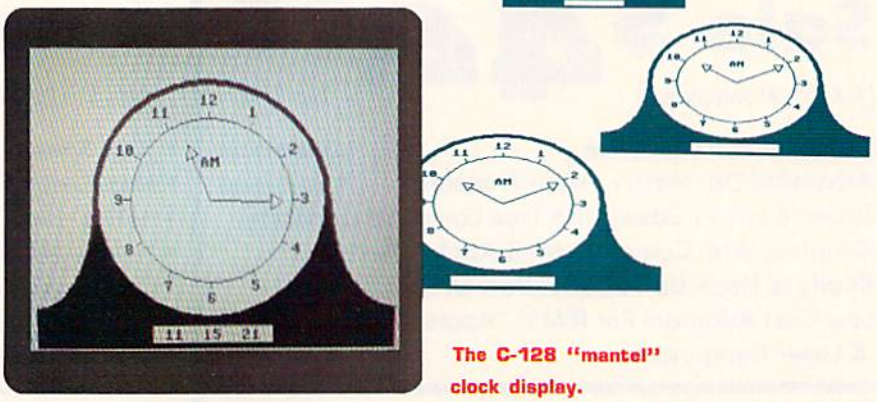
Since the display is updated every second or so, you may wonder why it appears to be continuous. Here's how I achieved that effect. After selecting Bit-Mapped mode, the video memory is moved to another video bank, and a screen of data is created in the bit-mapped location. Next, a machine language subroutine switches that block of data to the new location—too quickly to be noticed. At this time, the old screen is erased and a new one starts replacing it in the same location. The result is a display that doesn't wink, blink or otherwise appear corrupted. However, rounding off pixels occasionally gives small odd movements to the hands.

In early versions of C-128 Clock, I derived the time from Basic's TI$ function. However, TI$ isn't very accurate, and I noticed that the clocks were losing time, so I switched over to the 6526 CIA-1 chip, which derives the time from the ac powerline frequency.

Foreign users please note that bit 7 in location 56334 must be set for 50 Hz. In line 420, replace PEEK (C + 6) AND 127 with PEEK (C + 6) OR 128.

Now, who will be first to add a calendar to the C-128 Clock? Or an alarm? Or a control circuit for the coffee pot? Or perhaps some hams or aviators might like the digital readout to display Greenwich Mean Time? R

Jesse Sherwood, who is an associate professor of physics at the University of Tennessee at Martin, enjoys programming on his C-128 in his spare time.



The C-128 "mantel" clock display.

Listing 1. C-128 Clock program.

```
10 PRINT CHR$(147)       :REM*220
20 PRINT SPC(32)"{CTRL 9}C-128
   CLOCK{CTRL Ø}"        :REM*134
30 PRINT SPC(25)"{CRSR DN}BY JE
   SSE E. SHERWOOD"      :REM*169
40 PRINT"{CRSR DN}SET IN THE 24
   -HOUR FORMAT. ENTER THE HOUR
   S, MINUTES, AND SECONDS AS P
   ROMPTED.":PRINT"THE CLOCK ST
   ARTS WHEN {CTRL 9}RETURN{CTR
   L Ø} IS PRESSED."     :REM*94
50 PRINT SPC(25)"{CRSR DN}BE PA
   TIENT! I'M BUSY DRAWING!"
                         :REM*41
60 FAST                  :REM*133
70 COLOR Ø,2:COLOR 1,1:COLOR 4,
   15:COLOR 5,2:GRAPHIC 1,1:BOX
   1,11Ø,181,21Ø,193     :REM*242
80 POKE 56576,(PEEK(56576) AND
   252) OR 2             :REM*107
90 FOR Z=Ø TO 39:READ Z$:POKE (
   2Ø48+Z),DEC(Z$):NEXT Z:REM*2
100 DRAW 1,1Ø,17Ø TO 1Ø,196 TO
    3Ø9,196 TO 3Ø9,17Ø :REM*238
110 CIRCLE 1,1Ø,1ØØ,42*1.25,7Ø,
    9Ø,18Ø:CIRCLE 1,3Ø9,1ØØ,42*
    1.25,7Ø,18Ø,27Ø      :REM*231
120 CHAR 1,19,4,"12" :CHAR 1,2Ø
    ,2Ø,"6" :CHAR 1,1Ø,12,"9":C
    HAR 1,29,12,"3"      :REM*207
130 CHAR 1,24,5,"1":CHAR 1,28,8
    ,"2":CHAR 1,28,16,"4":CHAR
    1,24,19,"5"          :REM*53
```

RUN it right: C-128

```
14Ø CHAR 1,15,19,"7":CHAR 1,11,
    16,"8":CHAR 1,11,8,"1Ø":CHA
    R 1,14,5,"11"          :REM*133
15Ø SSHAPE K$,16Ø,16Ø,17Ø,169:G
    SHAPE K$,156,16Ø       :REM*197
16Ø SSHAPE L$,88,64,1Ø8,71:GSHA
    PE L$,82,64            :REM*131
17Ø CIRCLE 1,159,1ØØ,75*1.25,75
    :CIRCLE 1,16Ø,1ØØ,53*1.25,5
    3:CIRCLE 1,159,1ØØ,78*1.25,
    78,27Ø,9Ø              :REM*21
18Ø TEMPO 6:ENVELOPE 9,Ø,11,Ø,2
    ,4:PLAY "V1T9U15XØ":PLAY "V
    3T9U8XØ"               :REM*223
19Ø A$="V1O5HEV3B V1#GV3O6#D V1
    O5#FV3O6#C V1O4BV3O5#F HRM"
                           :REM*84
2ØØ B$="V1O5HEV3B V1O5#FV3O6#C
    V1#GV3O6#D V1O5EV3B HRM"
                           :REM*226
21Ø C$="V1O5H#GV3O6#D V1O5EV3B
    V1O5#FV3O6#C V1O4BV3O5#F HR
    M"                     :REM*176
22Ø D$="V1O4HBV3O5#F V1O5#FV3O6
    #C V1#GV3O6#D V1O5EV3B HRM"
                           :REM*195
23Ø E$="V1O5H#GV3O6#D V1O5#FV3O
    6#C V1O5EV3B V1O4BV3O5#F HR
    M"                     :REM*229
24Ø F$="V1O4HBV3O5#F HRM"
                           :REM*1Ø8
25Ø R=53:S=57:XO=16Ø:YO=1ØØ:TP=
    6.2832                 :REM*24
26Ø FOR D=Ø TO 11          :REM*158
27Ø XD=XO+R*1.25*SIN(TP*D/12):X
    E=XO+S*1.25*SIN(TP*D/12)
                           :REM*3Ø
28Ø YD=YO-R*COS(TP*D/12):YE=YO-
    S*COS(TP*D/12)         :REM*166
29Ø DRAW 1,XD,YD TO XE,YE
                           :REM*159
3ØØ NEXT D                 :REM*52
31Ø CONT                   :REM*2Ø9
32Ø PAINT 1,5Ø,175         :REM*183
33Ø COLOR 1,1              :REM*216
34Ø XU=XO:YU=YO:XV=XO:YV=YO
                           :REM*214
35Ø INPUT "{2Ø SPACEs}ENTER STA
    RT TIME AS {CTRL 9}HHMMSS{C
    TRL Ø}";S$:PRINT:PRINT
                           :REM*187
36Ø PRINT SPC(2Ø)"CLOCK IS NOW
    ON 4Ø-COLUMN SCREEN."
                           :REM*2Ø4
37Ø C=56328:HS$=LEFT$(S$,2):MS$
    =MID$(S$,3,2):SS$=RIGHT$(S$
    ,2)                    :REM*84
38Ø HS=VAL(HS$):MS=VAL(MS$):SS=
    VAL(SS$)               :REM*147
39Ø IF HS>11 THEN HS=HS+68
                           :REM*44
4ØØ POKE (C+7),PEEK(C+7) AND 12
    7:POKE (C+6),PEEK(C+6) AND
    127                    :REM*221
41Ø POKE (C+3),6*INT(HS/1Ø)+HS
                           :REM*69
42Ø POKE (C+2),6*INT(MS/1Ø)+MS
                           :REM*229
43Ø POKE (C+1),6*INT(SS/1Ø)+SS
                           :REM*33
44Ø POKE C,Ø               :REM*29
45Ø HR=PEEK(C+3):MR=PEEK(C+2):S
    R=PEEK(C+1):TR=PEEK(C):FL=1
    -(HR AND 128)/128      :REM*2Ø1
46Ø IF HR>36 THEN HR=(HR AND 12
    7)                     :REM*223
47Ø H=HR-6*INT(HR/16):M=MR-6*IN
    T(MR/16):S=SR-6*INT(SR/16)
                           :REM*92
48Ø IF FL=1 THEN CHAR 1,19,9,"A
    M"                     :REM*21Ø
49Ø IF FL=Ø THEN CHAR 1,19,9,"P
    M"                     :REM*218
5ØØ MA=TP*(M/6Ø+S/36ØØ):HA=TP*(
    H/12+M/72Ø)            :REM*127
51Ø XM=XO+4Ø*1.25*SIN(MA):YM=YO
    -4Ø*COS(MA)            :REM*156
52Ø XH=XO+3Ø*1.25*SIN(HA):YH=YO
    -3Ø*COS(HA)            :REM*17
53Ø CHAR Ø,14,23,"{11 SPACEs}"
                           :REM*77
54Ø DRAW Ø,XO,YO TO XU,YU TO 5;
    9Ø+6*U TO 1Ø;33Ø+6*U TO 1Ø;
    21Ø+6*U TO XU,YU       :REM*244
55Ø DRAW Ø,XO,YO TO XV,YV TO 5;
    9Ø+3Ø*V+U/2 TO 1Ø;33Ø+3Ø*V+
    U/2 TO 1Ø;21Ø+3Ø*V+U/2 TO X
    V,YV                   :REM*195
56Ø DRAW 1,XO,YO TO XM,YM TO 5;
    9Ø+6*M TO 1Ø;33Ø+6*M TO 1Ø;
    21Ø+6*M TO XM,YM       :REM*227
57Ø DRAW 1,XO,YO TO XH,YH TO 5;
    9Ø+3Ø*H+M/2 TO 1Ø;33Ø+3Ø*H+
    M/2 TO 1Ø;21Ø+3Ø*H+M/2 TO X
    H,YH                   :REM*3
58Ø XU=XM:YU=YM:XV=XH:YV=YH:U=M
    :V=H                   :REM*2Ø6
59Ø IF FL=1 AND H=12 THEN J=Ø
                           :REM*137
6ØØ IF FL=1 AND H<12 THEN J=H
                           :REM*41
61Ø IF FL=Ø AND H=12 THEN J=H
                           :REM*44
62Ø IF FL=O AND H<12 THEN J=H+1
    2                      :REM*72
63Ø J$=STR$(J):K$=STR$(M):L$=ST
    R$(S)                  :REM*154
64Ø CHAR 1,14,23,J$+" "+K$+" "+
    L$                     :REM*9
65Ø MM=M/6Ø+S/36ØØ:G=Ø     :REM*66
66Ø PP=.ØØ954              :REM*35
67Ø IF ABS(MM-1/4)<PP THEN CHAR
     1,14,23,"{11 SPACEs}":G=1
                           :REM*119
68Ø IF ABS(MM-1/2)=<PP THEN CHA
    R 1,14,23,"{11 SPACEs}":G=2
                           :REM*62
69Ø IF ABS(MM-3/4)=<PP THEN CHA
    R 1,14,23,"{11 SPACEs}":G=3
                           :REM*14Ø
7ØØ IF ABS(MM)=<PP THEN CHAR 1,
    14,23,"{11 SPACEs}":G=4
                           :REM*118
71Ø SLOW                   :REM*2Ø
72Ø BANK Ø                 :REM*1Ø2
73Ø SYS 2Ø48,Ø,Ø,Ø         :REM*139
74Ø BANK 15                :REM*72
75Ø ON G GOTO 77Ø,78Ø,79Ø,8ØØ
                           :REM*58
76Ø GOTO 45Ø               :REM*77
77Ø PLAY E$:GOTO 45Ø       :REM*141
78Ø PLAY A$+B$:GOTO 45Ø:REM*119
79Ø PLAY C$+D$+E$:GOTO 45Ø
                           :REM*225
8ØØ PLAY A$+B$+C$+D$:FOR I=1 TO
     H:PLAY F$:NEXT I:GOTO 45Ø
                           :REM*2Ø8
81Ø DATA 86,FA,86,FC,A2,1C,86,F
    B,A2,5C,86,FD,4C,19,Ø8,C8,1
    8,CØ,ØØ,DØ             :REM*1Ø9
82Ø DATA Ø4,E6,FB,E6,FD,B1,FA,9
    1,FC,A9,3F,C5,FB,DØ,EC,CØ,4
    Ø,DØ,E8,6Ø             :REM*2Ø6 ■
```

GEOWATCH

Berkeley offers geoSpell, readers share geoTips and don't forget the GEOS contest!

By TIM WALSH

HAVING SPENT THE LAST FIVE months as *RUN*'s Magic columnist, I've amassed a collection of GEOS hints, tips and shortcuts, from which I'm selecting the best for this month's geoWatch column. We are calling them geoTips, to differentiate them from Magic tricks. If you have some original geoTips, you can earn cash and recognition by having them published in future geoWatch columns. See the end of this column for mailing details.

GEOTIPS

INSTALLING GEOWRITE—Many first-time users of geoWrite Workshop 128 have trouble installing it on disk, because the user's manual fails to mention that your 1571 must be in 1541 mode. Here's the proper procedure for installation:

1. Boot the GEOS 128 system disk.
2. Open the Configure 128 file.
3. Designate disk drive A as a 1541.
4. Close the GEOS 128 system disk.
5. Insert the geoWrite 128 disk.
6. Follow the installation instructions in the geoWrite Workshop 128 manual.

—JOHN D. OTTINI
ST. PETERSBURG, FL

OPENING GEOS DISK SPACE—When using geoWrite and geoPaint, you'll occasionally end up with too many files on a work disk and won't be able to save more files to that disk. There'd seem to be only two alternatives in this situation: delete older files from the disk, which isn't a good idea if they happen to be valuable; or go through the time-consuming hassle of formatting and copying applications to a new GEOS work disk—if you're fortunate enough to have an extra disk handy.

Since both of these options look bleak, I've developed a third, more effective, option to open up space on work disks. First, move older, less important file icons from the deskTop to the bottom border. Next, with a disk notcher (available at any computer store for $5–$15) cut a notch in the unnotched side of the work disk. Now, after formatting, you can copy these older files to the flip side of the disk and save your new, more important files to the top side.

To recall those older files from the flip side, just invert the disk, place it in the disk drive and select the Open Disk option. Presto! They're back!

Of course, if you're using a 1571 drive, it's likely you're already using the second side of the disk. In that case, there's no alternative to getting a second work disk.

—SHAUN JONES
THACKERVILLE, OK

REMOVING UNWANTED FILES—Nearly every first-time GEOS user, in eagerness to use the system, has saved to the master disk a file that later needed to be removed. Unfortunately, when you try to bring a file icon to the wastebasket, most versions of GEOS respond with the message: "The operation requested cannot be performed on a Master/Boot disk."

All you need to do is check the Info block to make sure the file's write protection has been removed. Then move the unwanted file's icon down to the border area below the deskTop, as though you were going to copy it to another disk. Finally, pick it up from that area and deposit it in the wastebasket. Your unwanted file will be banished to the netherlands of GEOS.

—GREG SULLIVAN
HUDSON, NY

DOUBLE-CLICKING GEOPAINT—Several frequently used geoPaint procedures can be streamlined by double-clicking the mouse button or joystick fire-button. For instance, to rapidly prepare the entire work screen for copying or cutting, position the pointer on the Edit icon at the top right of the tool area (not to be confused with the top right of the command bar) and double-click.

For another shortcut, double-click the Brush icon to make the Brush menu appear. Double-clicking the Pencil icon places you in Pixel Edit mode, and double-clicking it again returns you to normal edit. As most GEOS users know, double-clicking the Eraser icon in Normal mode erases the entire screen, but just the screen area currently displayed when you're in Pixel Edit mode.

—GREG SULLIVAN
HUDSON, NY

GEOWRITE DISK-READING ERRORS—Sooner or later, you'll get an "Error Reading Disk" message when printing a geoWrite file. But don't panic—just repeat the print process, and it'll probably work fine. If another read error appears, try closing the file and printing from the deskTop. If it happens again, try copying the file to a second work disk. Just make sure no important files reside on that disk, because your trouble-plagued geoWrite file might corrupt *its* contents, too.

—ROBERT ROBERGE
METHUEN, MA

GEOS 64 TO DOODLE!—I've developed a short program that converts any GEOS 64 screen to Doodle! format and automatically saves it to disk as a file called DDGEOS. You must run the program on either a C-128 or a C-64 equipped with some sort of reset switch, since a hard system reset is needed to activate it.

Load and run GEOS 64 (any version), display your screen of choice and press the reset switch. Then immediately place a disk containing a copy of my program in the disk drive and load and run it. The DDGEOS file will be saved to disk. GEOS 64 to Doodle! doesn't include a save-with-replace option, so, after you've used my program one or more times, be sure you scratch any DDGEOS file already on the disk.

Now you can load your DDGEOS file into Doodle! or any Doodle!-compatible program without any problem.

```
Ø REM GEOS TO DOODLE! - ALEX CH
  ANIOTIS                  :REM*24
1Ø FOR X= Ø TO 127:READY:POKE 8
   192 +X,Y:CK=CK+Y:NEXT
                           :REM*218 ►
```

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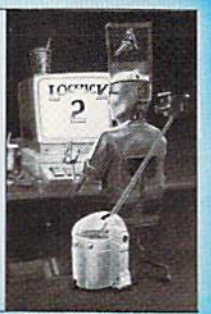

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```
2Ø IFCK<>14381 THEN PRINT "ERRO
   R IN DATA STATEMENTS...":END
                          :REM*195
3Ø SYS 8192               :REM*158
4Ø DATA 12Ø,169,52,133,1,162,Ø,
   189,Ø,16Ø,157,Ø,96,232,2Ø8,2
   47,238,9,32            :REM*2Ø1
5Ø DATA 238,12,32,173,9,32,2Ø1,
   192,2Ø8,232,162,Ø,189,Ø,14Ø,
   157,Ø,92               :REM*22Ø
6Ø DATA 189,Ø,141,157,Ø,93,189,
   Ø,142,157,Ø,94,189,Ø,143,157
   ,Ø,95,232              :REM*178
7Ø DATA 2Ø8,229,169,55,133,1,88
   ,169,1,162,8,16Ø,1,32,186,25
   5,169,6                :REM*63
8Ø DATA 162,1Ø3,16Ø,32,32,189,2
   55,169,Ø,133,245,169,92,133,
   246,169                :REM*94
9Ø DATA 245,162,4,16Ø,128,32,21
   6,255,88,96,96,96,96,68,68,7
   1,69                   :REM*236
1ØØ DATA 79,83,32,32,96,96,96,9
    6,96,96,96,96,96,96,96,96,9
    6,96,96,96,96         :REM*2
```

—ALEX CHANIOTIS
MIAMI, FL

Editor's note: As an avid user of 64 graphics utilities, I've found GEOS 64 to Doodle! extremely useful. The DDGEOS retains individual pixels from any GEOS screen with uncanny precision. With it, all 16 colors displayed on geoPaint screens, the deskTop, geoWrite documents and anything else you create using GEOS can be saved in Doodle! format. —TW

GEOS CONTEST

Don't forget the GEOS Desktop Publishing Contest! You have until June 30 to send your most original desktop publishing creation to Berkeley Softworks. You could win $1000 in cash, or one of a number of other great prizes. For details, see Berkeley's ad on page 81.

CORRECTION

The March geoWatch column provided incorrect information regarding installation of the GEOS 128 program. Rob Siegel, marketing assistant for Berkeley Softworks, reports that the correct information is as follows:

If you own any GEOS applications (such as geoPublish, geoFile, etc.) and use them with GEOS for the 64, you can use them later with GEOS 128. When first booting with GEOS 128, answer "yes" when you receive the initial dialogue box asking if you have installed any GEOS applications before. GEOS will then ask you to insert any application you own into the disk drive, and will link it to your new GEOS 128 disk. In this way, you can use any previously purchased programs with both your GEOS for the 64 and your GEOS 128.

If you have not purchased any GEOS applications, answer "no." Your future use of GEOS applications will not be hindered in any way, as previously stated in this column. ■

Send your questions on GEOS and related applications, along with any geoTips you may have, to:

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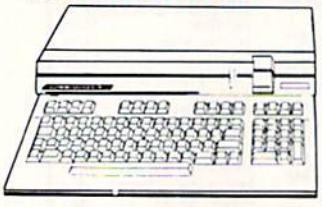

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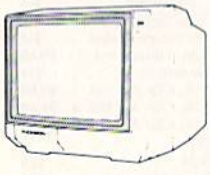

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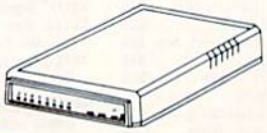

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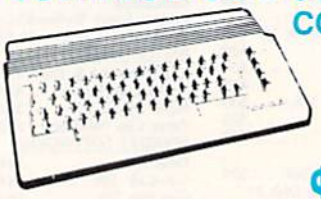

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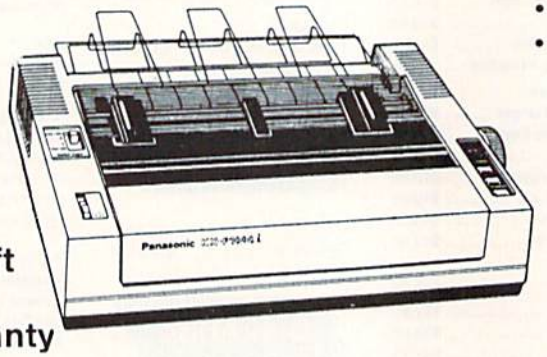

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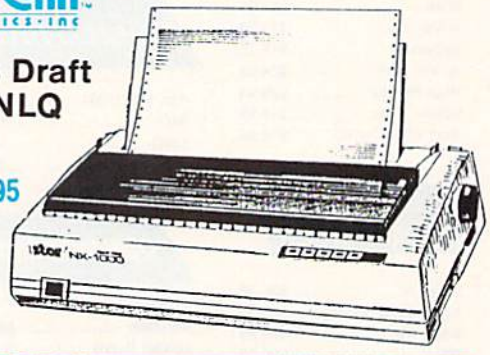

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Mark "Mac" Bowser, Sales Manager

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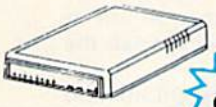

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TELECOMPUTING WORKSHOP

Which one really is cheaper—Q-Link or GEnie? Also, make some online matches.

By DAVID BRADLEY

TELECOMPUTING WORKSHOP IS devoted to modems, terminal programs and the like, but this month I'm going to start off with a couple of quick tips about telephones.

First, if you have a phone with a real bell in your computer room, don't set disks anywhere near it. When the bell goes off, it produces a strong magnetic field that's likely to scramble the disks. If there's another phone on the same number that you can hear from where you sit, you can avoid the whole problem by opening up the phone in your computer area and disconnecting the bell.

The Feather Weight telephone, available at K-Mart, is great for those who like to talk on the phone while working on their computer. It costs less than $20 and fits just about any size head. In fact, my 6-week-old nephew Kyle is able to wear ours just fine. Of course, it'll be much more useful to him when he can talk.

Moving to other things, when you have mysterious trouble with telecommunications, you may be able to fix the problem by turning off your computer system and disconnecting all the peripherals except the modem, monitor and disk drive. Printers, interfaces, cartridges and other devices sometimes make things work improperly.

MATCHMAKER, MATCHMAKER...

Getting telecommunications enthusiasts together assumes a new dimension with the Dial-Your-Match BBS software from Matchmaker Enterprises, PO Box 6055, Burbank, CA 91510. This program comes in versions for the VIC-20 expanded to 32K, the C-64 and the C-128. It supports most popular modems, like the Commodore 1650, 1660 and 1670 and the Hayes and Hayes clones, but *not* the Volks 6470 and 6480. Dial-Your-Match comes with a printed manual that really shows how to make the program do what you want it to, and you get a phone number for help in case you still run into problems.

TAKING COMMAND

Is your computer area a mess because you don't have room for everything? I've discovered that the Command Center equipment organizer from Ketek (PO Box 203, Oakdale, IA 52319) can really save desk space. It's reduced the area that my system occupies from 607 to 271 square inches.

The Command Center holds one or two disk drives, and the monitor or TV sits on top. The C-64 version, which I have, also hides a bit of the computer. The nicest part is that the cables fit inside, and there's a built-in power bar on the back that's all ready and waiting to receive plugs from up to five devices. The power bar is controlled by a switch on the left side.

As a modem user, you'll want a Command Center with an on-line/off-line switch on the right side. This switch lets you leave your modem plugged in all the time, an especially handy feature for owners of the Commodore 1670, which insists on answering calls anytime the computer is on and the modem is connected to the phone line.

There are three versions of the Command Center available: one each for the C-64 and 64C at $109.95 and one for the C-128 at $124.95. The on-line/off-line switch is a $9.95 option on the C-64 and 64C versions.

Before you order a Command Center, be sure you have enough vertical space for it. My C-64 version is about 8 inches high and my 1701 monitor adds 14 inches, so I needed 22 inches of clearance.

Now it's time for this month's reader questions.

Q *I subscribe to Q-Link, and it's getting kind of expensive. Does the amount of time I'm online appear on my telephone bill? Is GEnie less expensive than Q-Link, and does it offer the same services?*

—GABRIEL HIDALGO
JACKSON HEIGHTS, NY

A Concerning the phone charges, when you call a local number to access an online service, it doesn't appear on your phone bill, but if you call long-distance, it does. The phone company considers a modem call the same as a voice call.

As for the cost of Q-Link and GEnie, I've outlined their standard charges in Table 1. As you read the table, keep in mind that the hourly rate for Q-Link refers to plus time, which you'll probably be using, because the free non-plus services are pretty limited. GEnie doesn't have the plus/non-plus distinction. Also note that the Q-Link monthly charge includes a "free" hour of plus time and that, while Q-Link doesn't levy a registration fee, you must buy their software unless you get it free with GEOS or a Commodore modem.

Which network works out to be cheaper? Well, it depends. Refer to the table again, and we'll calculate some sample charges. Say you join GEnie in April and use it for five hours. You pay $43. If you do the same with Q-Link, the software, the monthly fee and five hours of plus time come to $39.10. (Remember, one hour of plus time is "free.") Along comes May and you're busy with work or school and don't call either service at all. GEnie charges nothing, but Q-Link wants $9.95. During June you have some spare time again and use both services for 11 hours, costing $55 on GEnie and $57.95 on Q-Link. In July you're on vacation and have a lot of spare time, so you use both services for 26 hours. GEnie comes to $130 for that month, and Q-Link to $129.95.

Looking at the entire four months, the total for GEnie is $228 and for Q-Link $236.95, making GEnie a bit cheaper. However, in two of the individual months Q-Link costs less. In other words, the best deal for you depends on how much time you spend online. Note that these figures don't take into account any time you win or earn while online or other specials the networks might have.

The services offered by Q-Link and GEnie are similar, including special interest groups (SIGs) on computer- and non-computer-related topics. Q-Link is Commodore-specific, while GEnie provides SIGs for users of various ma-

chines. Many of those probably won't be of interest to you.

It's certainly easier to log onto Q-Link. With a C-64, all you have to do is type in LOAD"0:*",8,1. With a C-128, you insert the disk in the drive, turn on the system and the disk boots automatically and logs you on. To log onto GEnie, you must dial their phone number and, when you get connected, enter your name and password.

Menu choices are made on GEnie by typing in the entire command. This may sound slow, but once you get used to the commands, you can turn off the menus and move around quickly. The Commodore-specific Q-Link software lets you choose by just pressing F1.

Those who are brand new to telecommunications will probably find Q-Link easier. When my wife's mother sat down in front of Q-Link for the first time, she was zipping around with confidence in less than 15 minutes. As a matter of fact, that was her first time on any network.

Q *I have a C-128, a Sears SR3000 monitor, two 1571 disk drives, two Atari joysticks, a 1351 mouse, an Epson MX-100 printer and a second-hand 1650 Auto-Modem, which came with no instructions or software. I want to subscribe to CompuServe or Q-Link so I can upload and download information and talk with other users, and I need the best software at the lowest price. What do you recommend, where can I get it and for how much?*

—JEREMIAH JONES
TEXARKANA, AR

A To get involved with Q-Link, you need their special software, which costs $9.95. You can order by calling 800-392-8200.

Table 1. Q-Link and GEnie cost comparison.

	Registration Fee	Monthly Fee	Hourly Rate	Software Cost
GEnie	$18	none	$5	none
Q-Link	none	$9.95	$4.80	$9.95

Table 2. Sources of Commodore public domain software for the C-64 and C-128.

USER'S GROUPS:

MUGS (Muscatine User Group Support)
1836 Hershey Ave.
Muscatine, IA 52761
319-262-8279

TPUG (Toronto Pet User's Group)
5300 Yonge St.
Toronto, Ontario
Canada M2N 5R2
416-733-2933

COMMERCIAL:

JLH Co.
Dept. 4
PO Box 67021
Topeka, KS 66667
913-478-4979

Lightspeed Software
PO Box 7037
Chesapeake, VA 23323

Public Domain Solutions
PO Box 832
Tallevast, FL 34270
Orders, 800-634-5546;
help, 813-378-2394

You can access CompuServe with any commercial or public domain terminal program that's compatible with your equipment. Before spending a lot on commercial software, I'd suggest you try a program from the public domain. NezTerm, UltraTerm and Multi-Term are all good public domain programs that should work for you, and there are new public domain gems appearing on the telecommunications scene all the time. See Table 2 for a list of public domain software suppliers. When you call, describe your equipment and ask them to recommend a program.

Q *I hope to set up a BBS at my junior high school, which has a couple of Commodores with modems. What BBS program, preferably from the public domain, could I use?*

—BILL BOWEN
LAWRENCE, KS

A I'm familiar with lots of BBS programs for the C-64, but I can't suggest one without knowing the type of disk drive and, more importantly, the type of modem you'll be using. Contact one of the suppliers I've listed in Table 2, tell them what equipment you'll be running and ask for their suggestion. And, be sure you give me all the pertinent information you can when you write for telecommunications advice. ■

Telecomputing Workshop is a monthly column dedicated to the needs of RUN *readers who are using, or intend to use, a Commodore computer for telecommunications. We invite you to submit your questions and comments to:*

David Bradley
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You can leave online messages for David Bradley on QuantumLink (DavBradley), American PeopleLink (DavBradley), Delphi (DavidBradley) or via the PunterNet to 13/SYSOP or 13/David Bradley.

COMMODORE CLINIC

How can you speed up or slow down output to the screen, or save multicolor graphic screens with your C-128?

By LOU WALLACE

SOFTWARE

Q *My question has to do with GEOS 128. I've had it for some time and find geoPaint convenient to use. But I'm not sold on its word processor, in spite of all the fonts. I'd like to convert the geoPaint pictures to another format, preferably Doodle!, so that I can work on them in Basic 7.0 (or Basic 8.0) and, again, print as I want to. As it is, I have to stick to GEOS's word processor to use the GEOS pictures.*

Can you suggest a way to convert geoPaint 128 files to some other format, or suggest a commercial program that will help me accomplish this?

—E. E. GOODALE
SARATOGA, CA

A I don't know of any commercial programs that will convert GEOS 128 pictures to Doodle!, but there are public domain programs for that purpose on the commercial BBS networks, such as GEnie and QuantumLink. Once you have the picture in Doodle! format, a program called Colorez (available from Briwall, PO Box 129, Kutztown, PA 19530) will convert Doodle! and other 40-column pictures to Basic 8.0 format for 80-column display.

HARDWARE

Q *I have an opportunity to buy a 4040 disk drive to use with my C-64. Is it compatible with the 64? Can I use programs like Fast Hack'em for making backups?*

—DAVID PAPP
ANN ARBOR, MI

A The 4040, a dual drive originally made for early Commodore computers, can be used with the 64, but you'll need an IEEE interface, as it is not a standard serial connection like that used in the 1541, 1571 and 1581 drives. Two companies that sell IEEE interfaces for the C-64 are Skyles Electric Works (231-E S. Whisman Rd., Mountain View, CA 94041) and Progressive Peripherals (464 Kalamath St., Denver, CO 80204). You won't be able to use Fast Hack'em, however, as it makes copies between two separate disk devices (for example, devices 8 and 9), while the 4040 drives are addressed as device 8, drives 0 and 1.

However, you can use the CBM DOS Backup command to make copies between the two drives in the 4040. Of course, it will not be possible to reproduce copy-protected software. Moreover, while the 4040 and 1541 drives are read-compatible, they are not completely write-compatible. It's possible to damage data on a disk that's been written to by both a 1541 and 4040. You can avoid that problem by running the following short program before writing to the 1541 formatted disks. This changes the gap used by the 4040 to one that's compatible with the 1541.

```
10 OPEN 15,8,15
20 PRINT#15,"m-w"CHR$(157)
   ;CHR$(16);CHR$(1);CHR$(8)
30 CLOSE 15
```

PROGRAMMING

Q *What do you do when you've played one C-64 game, and you want to reset and play a different game without using the on/off switch? The reason I ask is that I want to use the switch as little as possible. Also, what is a Poke statement in a program for, and how do you use it in a C-64 program?*

—NGHIA LUONG
SANTA ANA, CA

A Sometimes you can press the run-stop/restore key combination, and then enter the command SYS 64738 to perform a "soft" reset. However, most games disable the run-stop/restore combination, so that a soft reset won't work. An alternative is to add a hardware reset switch similar to that of the C-128. The easiest way to do that is to use a plug-in cartridge (like Power Cartridge or Blowup). But even then, some games install themselves in memory like an autostart cartridge, so any attempt to reset the computer merely restarts the game. In that event, you can only turn the computer off, wait about five seconds and turn it back on.

The Poke command is a way for the Basic programmer to place a number into a specific memory location in the computer's memory. The number must be in the range 0–255, as 255 is the largest value that can be contained in one byte of memory. To use it, just type POKE, followed by the memory address, a comma and then the value to place in that address. For example, if you wanted to put the character A onto the C-64 screen, you could type:

```
POKE 1024,65
```

This places the ASCII value 65 (the code for letter A) into memory location 1024, which is the first character cell, for the upper-left corner of the C-64 screen.

Related to the Poke command is the Peek command. This does the opposite, reading the contents of a memory address. For example,

```
A = PEEK(1024)
```

assigns to variable A the ASCII value of the byte at address 1024.

Q *I know that Apple computers have a Basic command called Speed, which sets the speed of output to the screen or printer. And I have noticed that in Activision's Hacker and Ghostbusters, the Speed command is available, but I cannot find any way of accessing it in CBM Basic. Does it exist on the C-64?*

—CHAD HAYNES
BECKLEY, WV

A No, there is no corresponding command for the C-64 (or the C-128). What the Activision programs do is slow down or speed up the screen output itself. You can emulate it quite easily in your programs, too. Just put a small delay loop between outputs, thusly:

```
100 PRINT A$:FOR T = 1 TO DE:NEXT
110 GOTO 100
```

By increasing the value of the variable ►

Finally, there's a beauty contest that any GEOS owner can win—provided you have the right tools. The GEOS Desktop Publishing Contest. All you need to win is your Commodore, your trusty GEOS applications (like geoWrite, geoPublish, Graphics Grabber, etc.) and your own imagination to win in any four categories and walk away with all kinds of prizes.

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- Publication of your entry in RUN Magazine
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- Six month subscription to Q-Link, the telecommunications service from Quantum Computer Services
- Twenty five pages of laser printed output from Laser Direct
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Seven Second Prizes!

- Complete library of C64 or C128 GEOS applications from Berkeley Softworks
- Commodore peripherals: 1670 1200 Baud Modem and your choice of a 1764 or 1750 RAM Expansion Module or 1351 Mouse
- Three month subscription to Q-Link, the telecommunications service from Quantum Computer Services.
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Seven Third Prizes!

- Your choice of any five C64 or C128 GEOS applications from Berkeley Softworks
- Commodore peripherals: 1670 1200 Baud Modem and your choice of a 1764 or 1750 RAM Expansion Module or 1351 Mouse
- Three month subscription to Q-Link, the telecommunications service from Quantum Computer Services.
- Five pages of laser printed output from Laser Direct
- Twelve month subscription to RUN magazine

Official Rules

1. Employees of Berkeley Softworks, Quantum Computer Services, Laser Direct, RUN Magazine, their advertising and promotional agencies and their immediate families are not eligible to enter the contest.

2. Each entry must be wholly the product of the developer in whose name the entry has been submitted. The entry may not have been published prior to this contest. Copyrighted images are ineligible.

3. Entries must be produced with GEOS or GEOS based applications (e.g. geoWrite, geoWrite Workshop, geoPaint, geoPublish, etc.).

4. Entries must be submitted in both printed output form (dot matrix or laser printed) and disk in 1541/1571 format. The following should be clearly marked on both the printout and the disk:
   A. Contestant's name, address and phone number
   B. Occupation (optional)
   C. The GEOS based application package(s) used to create the entry
   D. Intended use for the entry, if other than just for this contest (e.g. user newsletter, school, business, group etc.)

5. Entries become the property of Berkeley Softworks, which reserves the right to adapt, use or publish all entries received. No disks will be returned, so be sure to make a copy of your entry before you submit it to the contest.

6. Deadline for entries is June 30, 1988. Mail entries to Berkeley Softworks, P.O. Box 1835, Berkeley, CA, 94701 Attn: GEOS Desktop Publishing Contest.

7. Contestants may enter multiple categories, but may only submit one entry per category per division (e.g. one entry in the Flyer category, Dot Matrix division *and* one entry in the Flyer category, Laser Printer division). Regardless of the number of categories you enter, you will only be eligible to win one prize.

8. Final judging will be performed by the staff of RUN Magazine. The decisions of the judges are final in all respects. This includes decisions regarding creativity, similarity among entries and general suitability.

9. This contest is void where prohibited by law. All federal, state and local taxes are the sole responsibility of the winners.

General Conditions

- Entries will be judged on creativity, originality, composition, layout, content and overall design.
- Make sure your mailer will protect your printout and disk from damage. Affix sufficient first class postage. Mail your printout, disk and official entry blank to the above address before the June 30, 1988, deadline.
- Winners will be announced by September, 1988.

PLEASE PRINT

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Q *I've tried saving multicolor graphic screens (GRAPHIC 3) with my C-128 and have had no luck. All I can do is save the bitmap and one color; the other colors never show up right. According to Commodore, these colors are in the color memory area at 55296–56295. But saving that area of memory and reloading it has no effect on the colors of the images. Is there a way to save multicolor pictures from Basic, and if so, could you* please *let us in on the secret.*

—MORGAN HAUEISEN
HAMILTON, NJ

A Yes, it can be done from Basic, but if I tell you, you'll have to promise to keep our "secret" safe! There are three areas of memory you must save in order to completely reproduce a multicolor (GRAPHIC mode 3) screen on the C-128. The first is the area from 7168 to 16191, which contains the same color (7168–8191) and bitmap (8192–16191). You must also save the background color at 53281. (I also save the border at 53280.) And, as you know, the main color memory is at location 55296–56295. The trick is to be able to access that memory correctly, because in the C-128's multi-bank memory scheme, some areas are not accessible (even using the Bank command) without a little nudge. To demonstrate, I wrote a small program that creates a multicolor display, then saves it to disk. A second routine can be used to display the picture. You could easily use these as subroutines in your own programs for loading and saving pictures.

```
5 REM SAVE MULTICOLOR SCREEN
10 POKE 53280,7
20 COLOR 0,1:COLOR 1,2:COLOR
   2,3:COLOR 3,4
30 REM SAVE MC PICTURES
40 GRAPHIC3,1
50 REM CREATE SOMETHING
60 CIRCLE 1,40,100,35
70 CIRCLE 2,80,100,35
80 CIRCLE 3,120,100,35
90 REM SAVE IT
100 POKE 1,PEEK(1)AND254
110 BSAVE"BKGBDR",B13,P53280 TO
   P53282
120 BSAVE"CMEM",B15,P55296 TO
   P56296
130 BSAVE"SMEM – BMP",B0,P7168 TO
   P16192
140 GETKEY A$
150 GRAPHIC0
```

Once you've saved your pictures to disk, you can reload and display them with this routine:

```
10 REM RELOAD A SAVED MULTICOLOR
   PICTURE
20 GRAPHIC3,1
30 POKE 1,PEEK(1)AND254
40 BLOAD"BKGBDR",B13,P53280
50 BLOAD"CMEM",B15,P55296
60 BLOAD"SMEM – BMP",B0,P7168
70 GETKEY A$
80 GRAPHIC0 ■
```

Do you have a problem or question about your Commodore computer system, software or programming? Commodore Clinic can help. Just send your questions to:

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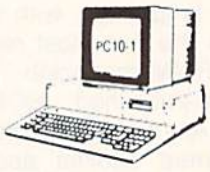

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From p. 12.

$498 Displaying 64 Doodle! Screens Made Easier

If you have a C-64 and some Doodle! screens, use my program to display the screens on your C-64 without having to use any additional graphics programs. Just substitute the filename of your Doodle! screen saved to disk in line 10 and run my program. Your Doodle! screen will appear in a few moments.

```
Ø REM DOODLE! PIC DISPLAY - MATT TOON
                                    :REM*225
1Ø IF A=Ø THEN A=1:LOAD "DDFILENAME",8,1
                                    :REM*139
2Ø A=53265:POKE A+3313,3:POKE A+3311,6
                                    :REM*1
3Ø POKE A+7,PEEK(A+7) OR 8          :REM*181
4Ø POKE A+7,(PEEK(A+7)AND 15) OR 112
                                    :REM*213
5Ø POKE A,PEEK(A) OR 32             :REM*146
```

—Matt Toon, Brentwood, CA

$499 Displaying Doodle! Screens In 128 Mode

If you're a C-128 owner, no program is needed to display your C-64 Doodle! screens in C-128 40-Column mode. To display your picture, place a disk with a Doodle! screen into the disk drive and enter the following statement in Direct mode:

```
GRAPHIC 1,1:BLOAD "DDFILENAME",B0,P7168
```

As in the above C-64 Doodle! trick, you'll have to place the correct filename in place of "DDFILENAME".

—Jamison K. Guyton, Clinton, SC

$49A Unblinking the C-64's Cursor

Most C-128 users know that they can stop, or freeze, the C-128's blinking cursor in both 40- and 80-Column modes by pressing ESC, followed by the E key. Running my program, No-Blink 64 Cursor, stops the C-64's cursor from blinking. Pressing run-stop/restore causes the cursor to begin blinking again, and entering SYS 688 refreezes the cursor.

```
Ø REM C-64 NON-BLINK CURSOR - JIM BERNARD
                                    :REM*2Ø6
1Ø FORX= 688 TO 722:READ A:POKE X,A:CK=CK+
   A:NEXT                           :REM*188
2Ø IF CK<>4197 THENPRINT "DATA ENTRY ERROR
   ":END                            :REM*133
3Ø SYS 688:NEW                      :REM*153
4Ø DATA 12Ø,169,189,141,2Ø,3,169,2,141,21,
   3,88,96,32,234,255,72,165        :REM*66
5Ø DATA 2Ø3,2Ø1,64,2Ø8,8,165,2Ø7,24Ø,4,1Ø4
   ,76,97,234,1Ø4,76,52,234         :REM*88
```

—Jim Bernard, Makakilo, HI

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even the smallest static shock can cause severe damage to computer equipment (some static packs a walloping 7000 volts!), I also lightly spray my anti-static/softener mixture on the carpet area around my computer. As a result, no static is present for several weeks between applications.

—NANCY BROWN, ELKHART, IN

$49C C-64 Data Errors Revisited

Magic Trick $469 in the February 1988 issue offered a method of locating Data statement errors that produce Illegal Quantity Error in Line XX messages. My alternative is to enter the following statement in Direct mode after receiving the Illegal Quantity message:

```
PRINT PEEK(63) + 256*PEEK(64)
```

The number that appears on the screen is the line number of the Data statement containing the illegal quantity. You can then list that line and compare it to the original.

—ROBERT V. TAYLOR, LITTLE ROCK, AR

$49D Help Find Basic 7.0 Errors

While the C-128's ability to permit up to 160 characters per program line is, for the most part, a desirable feature, it does have a drawback when you have a program line that's packed with multiple statements. Let's suppose you get an Illegal Quantity Error in line 595. So, in 80-Column mode, press the help key, and you see a long line like this:

```
595 IF LEFT$(PR$(J),1) = "#" THEN PRINT#4, PR$(J)
    STR$(I + NM - 1) SPC(SP - 1) PR$(J) STR$(I + NM):GOTO670
```

The chances are that you'll waste time checking the syntax and trying to trace the function of each command before you can begin looking for the source of the error.

Well, don't despair. Try breaking the line down into several smaller lines. If you've numbered your program in increments of five or ten, then you'll have no problem breaking down line 595 into vacant lines in between existing lines as follows:

```
595 IF LEFT$(PR$(J),1) = "#" THEN PRINT#4, PR$(J)
    STR$(I + NM - 1);
596 PRINT#4, SPC(SP - 1);
597 PRINT#4, PR$(J);
598 PRINT#4, STR$(I + NM)
599 GOTO 670
```

After breaking the line down, run the program again. You'll get the same Illegal Quantity Error in XXX, only now XXX might be line 595, 596, 597 or 598, narrowing the search down to a smaller line. You'll find that short lines make life a lot easier when you're debugging programs.

—SI LABAR, BETHLEHEM, PA

$49E Typing in Hex Loaders, Revised

My program, an alternative to Magic trick $485 (April 1988), modifies both the C-128's function keys and the keypad to facilitate entering hexadecimal listings published in *RUN*. After you type in and run my program, function keys F1, F3, F5 and F7 become A, B, C and D respectively, and the + and − keys on the keypad are redefined as E and F. Using these adjacent keys for the letters A–F, instead of hopping all over the keyboard, makes entering the hex data much easier. Finally, the F2 key will print the word DATA, so you'll no longer have to type it. ►

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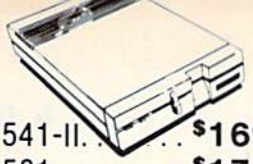

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MAGIC

```
Ø REM 128 ENTRY AID FOR RUN'S HEX LISTINGS
   - BOB KODADEK                        :REM*2Ø7
1Ø BANK 15                              :REM*113
2Ø VEC=DEC("Ø33E"):REM KEY VECTOR       :REM*231
3Ø LOC=DEC("ØCØØ"):REM NEW TABLE LOCATION
                                        :REM*2Ø5
4Ø MEM=DEC("FA8Ø"):REM OLD TABLE LOCATION
                                        :REM*249
5Ø FOR I=Ø TO 88                         :REM*45
6Ø POKE LOC+I,PEEK(MEM+I)               :REM*157
7Ø NEXT                                 :REM*2ØØ
8Ø POKE VEC,LOC AND 255:POKE VEC+1,INT(LOC
   /256)                                :REM*72
9Ø KEY 1,"A":KEY 3,"B":KEY 5,"C":KEY 7,"D"
                                        :REM*99
1ØØ POKE LOC+73,ASC("E"):POKE LOC+74,ASC("
    F")                                 :REM*2Ø
11Ø POKE LOC+82,ASC(",")                :REM*224
12Ø KEY 2, "DATA "                      :REM*143
```

—ROBERT KODADEK, ASTON, PA

$49F C-64 INPUT ENHANCED

Including the following statement in your Basic program lets you change the question mark generated by the Input statement to any other character desired:

```
100 FOR I=40960 TO 49151: POKE I, PEEK (I): NEXT: POKE 1,
    PEEK(1) AND 254
110 POKE 43846, X
```

Variable X in line 110 is any number from 0 to 255. The question mark normally following an Input statement is converted to the ASCII value of X. If you're inputting numbers, you might want to give X a value of 35, which produces a pound sign (#) to represent numeric input. Of course, you can change line numbers 100 and 110 if you want to place this routine anywhere in your program. Also, be patient, because this program takes a few minutes to run.

—JOE VANDERWERKEN, HUDSON FALLS, NY ■

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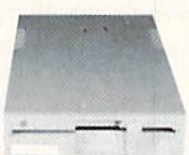

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SCRATCH AND SAVE

Do you hesitate to use the 1541's Save with Replace command because it might corrupt your disk files? If so, you're well aware of how risky the Save@ command is. But playing it safe is a problem, too, because the only other way to update a file and retain the original filename is to go through the work of deleting the old file first. Computers are supposed to relieve us of tasks, not give us more!

I wrote Scratch and Save to provide relief from the delete-file/save-file routine. Before it saves with a filename that already exists on the disk, it automatically scratches the old file for you. In essence, it performs the same function as Save with Replace, but avoids the danger of ruining your disk.

No special commands are needed to use Scratch and Save. In fact, the syntax is exactly the same as the normal SAVE "FILENAME",8.

Scratch and Save is compatible with fast-load cartridges, such as Epyx's Fast Load and Access Software's Mach 5. You should also be able to use it with any other program that saves files by using the Basic Kernal's Save command, as most programs do.

You can disable Scratch and Save by simultaneously pressing the run-stop and restore keys, and then reenable it by entering SYS 828. Ⓡ

```
10 REM SCRATCH & SAVE - DAVID ARCHIBALD
                                        :REM*63
20 FOR A = 828 TO 900:READ X:POKE A,X:NEXT
   A                                    :REM*59
30 PRINT"{SHFT CLR}SAVE WITH REPLACE IS NO
   W INSTALLED!"                        :REM*132
40 SYS 828:NEW                          :REM*157
50 DATA 173,50,3,141,131,3,173,51,3,141,13
   2,3,169,83,141,50,3,169,3,141        :REM*52
60 DATA 51,3,96,72,138,72,152,72,165,186,3
   2,177,255,169,111,32,147,255         :REM*37
70 DATA 169,83,32,168,255,169,58,32,168,25
   5,160,0,177,187,32,168,255,200       :REM*250
80 DATA 196,183,208,246,32,174,255,104,168
   ,104,170,104,108,131,3,0,0           :REM*69
```

—DAVID ARCHIBALD, FLINT, MI ■

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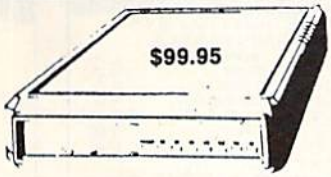

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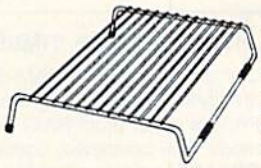

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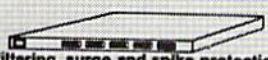

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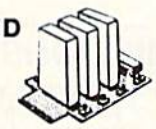

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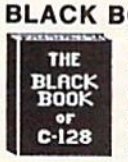

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Operates concurrent with RS232/modem	No	Yes
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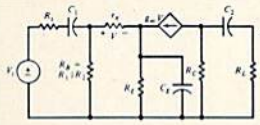

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RUN's Checksum

By BOB KODADEK

TYPE IN *RUN*'s CHECKSUM, which serves for both the C-64 and for the C-128 in either 40- or 80-Column mode, and save it to disk before running. When typing in a program from *RUN*, first load and run *RUN*'s Checksum. The screen will display the 64 or 128 version, whichever is appropriate, and a SYS number that deactivates the Checksum when typed in and followed by return. Always disable *RUN*'s Checksum before attempting to run another program. The same SYS number will reactivate the Checksum.

Keep the following in mind: You can abbreviate Basic keywords; spaces affect the checksum only when within quotes; and the order of characters affects the checksum.

When you press return after typing in a program line, a one-, two-, or three-digit number from 0 to 255 appears directly below the line just entered. If this number matches the checksum value in the program listing, the line is correct. You enter the next line by typing it in right over the previous line's checksum value. If the number that appears *doesn't* match the listing's checksum value, carefully compare the line with the magazine listing to find your error. Then move the cursor back up to the line and make your corrections. Now, after you press return, the correct checksum value should appear. Continue entering the listing in this way until all the lines have been correctly typed. Then deactivate *RUN*'s Checksum, using the SYS number. Save the finished program.

Listing 1. *RUN*'s Checksum program.

```
1Ø REM RUN'S CHECKSUM 64/128 - WRITTEN BY
   BOB KODADEK
2Ø MO=128:SA=3328:IF PEEK(4Ø96Ø)THEN MO=64
   :SA=49152
3Ø FOR I=ØTO14Ø:READ B:CK=CK+B:POKE SA+I,B
   :NEXT
4Ø IFCK<>16951 THENPRINT"DATA ERROR!":END
5Ø PRINTCHR$(147)STR$(MO)" RUN CHECKSUM":
   PRINT
6Ø PRINT"TO TOGGLE ON OR OFF, SYS"SA:IF MO
   =128 THEN 9Ø
7Ø POKESA+13,124:POKESA+15,165:POKESA+25,1
   24:POKESA+26,165
8Ø POKESA+39,2Ø:POKESA+41,21:POKESA+123,2Ø
   5:POKESA+124,189
9Ø POKESA+4,INT(SA/256):SYS SA:NEW
1ØØ DATA 12Ø,162,24,16Ø,13,173,4,3,2Ø1,24,
    2Ø8,4,162,13,16Ø,67,142,4,3,14Ø
11Ø DATA 5,3,88,96,32,13,67,152,72,169,Ø,1
    41,Ø,255,133,176,133,18Ø,166,22
12Ø DATA 164,23,134,167,132,168,17Ø,189,Ø,
    2,24Ø,58,2Ø1,48,144,7,2Ø1,58,176
13Ø DATA 3,232,2Ø8,24Ø,189,Ø,2,24Ø,42,2Ø1,
    32,2Ø8,4,164,18Ø,24Ø,31,2Ø1,34
14Ø DATA 2Ø8,6,165,18Ø,73,1,133,18Ø,23Ø,17
    6,164,176,165,167,24,125,Ø,2,133
15Ø DATA 167,165,168,1Ø5,Ø,133,168,136,2Ø8
    ,239,232,2Ø8,2Ø9,169,42,32,21Ø
16Ø DATA 255,165,167,69,168,17Ø,169,Ø,32,5
    Ø,142,169,32,32,21Ø,255,32,21Ø
17Ø DATA 255,169,13,32,21Ø,255,1Ø4,168,96■
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ADVENTURE GAME PROGRAM—

We'll also bring you an exciting C-64 adventure game entitled Special Delivery—a text and graphics game in which you'll encounter all sorts of strange obstacles. Special Delivery was originally slated for our May issue, but, due to space limitations, was rescheduled for June. We're sure you'll agree that it was worth the wait.

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	Productivity Pak III	65
	ReRun Sub Ad	49, 83
*	S & S Wholesalers	84
102	Soft Byte	64
245	Software Disc. of America	73
25	Strategic Simulations	25
26	SubLogic Corp.	13
155	Tenex Computer Express	89
209	Tussey Computer Products	20, 21
187	Utilities Unlimited	71
*	Value-Soft	91
96	Xetec, Inc.	72

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IT'S THE NEXT BEST THING TO SKIING THERE.

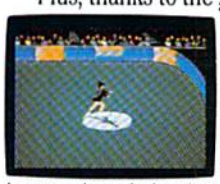
Or figure skating. Or cross-country skiing. Or even luging. In short, *The Games: Winter Edition* is one game that can bring you the thrills and glories of history-making athletic competition. It was designed with the help of former U.S. Olympic Team athletes. *And it's the only computer game to earn an official license from the 1988 U.S. Olympic Team.*

Behold the gates of glory. Now watch 'em whizz by.

Find out what it's like to be a human shock absorber in the Ski Jump. Double your blood pressure shooting down the chute in the Luge. Lean into a 30-mile-an-hour turn in Oval-Track Speed Skating. And then cross your threshold of pain in the Cross-Country event.

There are seven Herculean events in all. For one, two or up to eight players. With graphics so crisp and accurate you'll be tempted to bundle up.

Plus, thanks to the game's unique camera angles, you can view the Downhill and the Ski Jump events from the first-person or camera-angle points-of-view. One moment you're looking over your ski tips. And the next, you're watching your performance from the sidelines.

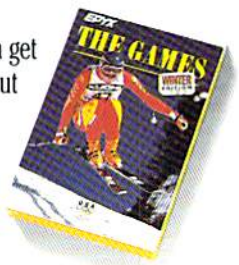


Just you and your shadow about to pull off a double-axle sit-spin.

Switch to the camera-angle point-of-view for a new perspective.

The Games: Winter Edition. Incredible graphics. Network-style camera angles. Excellent athlete control options. And opening and closing ceremonies modeled after those at Calgary.

Now you can get the thrills without the chills.



THE GAMES: WINTER EDITION

BY EPYX

Commodore 64/128, Apple II & compatibles, IBM & compatibles
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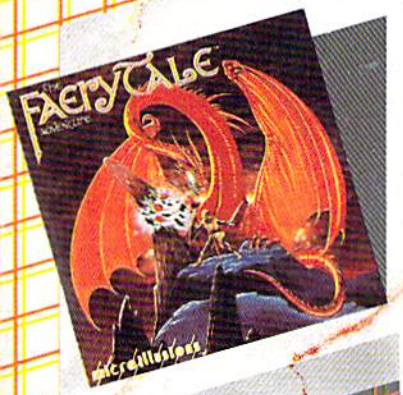
FaeryTale



Enter a Magical Land where you participate in the adventures of three brothers as they seek their ultimate fate in the Faery Tale Adventure. With over 19,200 playable screens, the quest takes you through a land full of vicious monsters, enchanted princesses, fearsome dragons and even a kindly old woodcutter or two.

Alms for the poor

Julian finds a cave

BlackJack Academy

Everything you ever wanted to know about the game of BlackJack. For the novice learning, or the pro polishing skills, BlackJack Academy offers both high powered instruction and realistic game play. Develop your skills, and have fun playing BlackJack Academy!

Split hands

Game in play

FIRE POWER

Fire Power is an action packed arcade style tank battle game that features continuous shoot 'em up excitement! Plot your moves to become king of the hill and capture your opponent's flag while continually fighting off his endless attempts at yours! Features single, double and modem playability!

Helicopter patrols add another challenging dimension

A successful rescue mission nears completion

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